File — 930-38610

UNION CARBIDE CORPORATION

CHEMICALS AND PLASTICS ENGINEERING

SOUTH CHARLESTON, WEST VIRGINIA

DEFINITION OF FACILITIES

WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM

PHASE II

SISTERSVILLE, WEST VIRGINIA

NOVEMBER 10, 1971

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

DEFINITION OF FACILITIES

WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM

SISTERSVILLE, WEST VIRGINIA

INTRODUCTION

Phase I of the three-phase program to improve the Sistersville Plant effluent quality is under construction. Facilities are being installed to segregate and collect all contaminated water into a new process sewer and to remove floatable materials from the existing stormwater sewer. These facilities were approved as Project 71-12-4 in April 1971.

Phase II of the program, defined in this report, will provide facilities to: (1) neutralize and clarify the process sewer effluent, and (2) dewater solids removed from the new clarification system and from an existing chlorosilanes neutralization system.

Phase II, in conjunction with Phase I, will provide primary treatment of the process and storm-water effluents from the plant. The effluents will be neutral and essentially free of floatable and settleable solids and oils as requested by the State of West Virginia.

The next project in the program, Phase III, will provide secondary treatment facilities to reduce the organic waste in the process sewer effluent. A Preliminary Budget Definition for the Phase III facilities will be submitted in November 1971.

The schedule for completing the three-phase program is:

- Phase I - Segregate and collect all contaminated wastewater for subsequent treatment by latter-March 1972.
- Phase II - Neutralize and clarify the collected wastewater by latter-November 1972.
- Phase III - Reduce soluble organics in the plant effluent by mid-September 1973.

INTRODUCTION (Cont'd)

This Definition of Facilities Report for Phase II has been approved by the Sistersville Plant Management Department, the Environmental Protection Team, and the Utilities Team.

SUMMARY

This project will provide the following facilities:

1. Equipment and instrumentation to improve the reliability and control of the chlorosilanes neutralization system.
2. A two-stage pit for neutralizing the process sewer effluent.
3. Equipment for unloading, storing, and slaking (slurrying) pebble lime; for storing lime slurry; and for feeding lime slurry to the neutralization system.
4. A two-basin clarification system to remove oils and floatable and settleable solids from wastewater leaving the neutralization system. This clarification system will discharge neutralized and clarified wastewater to Sugar Camp Run (a creek discharging into the Ohio River).
5. Two ponds for removing water from solids collected in the clarification system and the chlorosilanes neutralization system. Dewatered sludge in these ponds will be periodically removed to a solids landfill that will be provided by a separate project.
6. A wastewater collection system and a utilities distribution system within the waste treatment area, and new utility facilities in the Plant. The new plant facilities include a new steam header and a new recycle-water pumping station to provide additional steam and water for the project.

The estimated costs of this project are:

Capital	$1,530,000
Non-capital	16,000
Total	$1,546,000

The estimates are of plus or minus 10 percent accuracy.

SUMMARY (Cont'd)

Engineering for revising the chlorosilanes neutralization system will be performed by Plant Engineering at Sistersville. All other engineering will be performed by the Charleston Engineering Center.

Construction will be primarily by the Kanawha Valley Construction Group. A portion of the lime storage facilities will be installed under a lump sum contract.

This project will be completed within eleven months after the CBP is approved. The project schedule is based on CBP approval by the first of January 1972.

DESIGN BASIS

Facilities for neutralizing and clarifying the process sewer effluent have generally been designed for a flow expected by the year 1980. However, to reduce initial investment certain equipment that can be duplicated later has been sized to provide capacity to approximately 1975.

The following comparison shows the 1970-71 and estimated 1980 wastewater loads:

	1970-71	1975	Estimated 1980
Process Sewer (average conditions)			
Flow, gpm	1,800	3,000	4,700
HCl, percent	0.1	0.1	0.1
Suspended Solids, ppm	500	500	500

The flow shown above for 1970-71 is an estimate of the process wastewater flow that will result after completion of Phase I. The flow shown for 1980 was estimated by assuming a 10 percent annual growth rate of the 1970-71 flow. During this same period, a 15 percent annual growth rate has been projected in production.

A schematic flow diagram and material balance for these primary treatment facilities is shown on Page 12.

PROCESS FACILITIES DESCRIPTION

The primary treatment facilities described in this DOE have been divided into six systems:

Part 1 - Chlorosilanes Neutralization
Part 2 - Process Sewer Neutralization
Part 3 - Lime Storage and Slurry Preparation
Part 4 - Clarification
Part 5 - Sludge Dewatering
Part 6 - Process-Sewer Collection and Utilities Distribution for the Waste Treatment Area

These systems are described in the following sections. The equipment location is shown on Location and Plot Plans on Pages 13 and 14, respectively.

PROCESS FACILITIES DESCRIPTION (Cont'd)

Materials of construction for these systems have been determined from corrosion tests made in the existing acid sewer. Before neutralization, equipment and piping in contact with the wastewater will be constructed of acid-resistant materials such as Hastelloy, acid-resistant brick (for lining concrete), vitrified tile, and acid-resistant mortar. After neutralization, materials such as steel, epoxy-coated steel, concrete (without lining), vitrified tile, and standard mortar will be used.

Equipment for chlorosilanes neutralization will be constructed of epoxy-fiberglass, due to the acid by-product formed during neutralization. Standard materials of construction will be used for lime storage and slurry preparation.

Chlorosilanes Neutralization

Chlorosilanes residues are presently neutralized in either a continuous neutralizer system or a batch neutralizer system, depending on the type of chlorosilane waste. About 90 percent of the wastes are neutralized in the continuous system with lime slurry. In both systems, water is added to cool the reactor mass and to maintain a slurry of about five percent solids. The neutralized chlorosilane slurry from these systems will be dewatered in the new sludge ponds included in this project.

Capacity is not limited for neutralizing chlorosilanes in the existing systems, but problems do exist with on-stream reliability and with pH and flow controls. Also, acid fumes are not adequately controlled from the batch neutralizer. The revisions planned to eliminate these problems are:

1. Add a pH control for the reactor effluent.
2. Improve the feed flow-control instruments for makeup water, chlorosilane, and lime slurry.
3. Add a vent gas scrubbing system consisting of a scrubber an exhaust blower, and a circulating pump.

PROCESS FACILITIES DESCRIPTION (Cont'd)

Chlorosilanes Neutralization (Cont'd)

The revisions have been defined by the Environmental Protection Department at Sistersville. Engineering for these revisions will be done by Plant Engineering. An estimated $28,000 capital investment and $8,000 non-capital expense have been included in this project for this work.

Process Sewer Neutralization

The process sewer effluent will be neutralized with 20 percent lime slurry from a pH of approximately 2 to a pH of 7 to 9 in a two-stage, stirred, neutralization pit. The pH will be adjusted to meet the requirements of the Phase III biological treatment facilities. The total residence time in the neutralization pit will be three minutes, based on the 1980 flow. The inside pit dimensions will be 10 feet by 20 feet and a 10-feet water depth will be maintained. Each stage will be lined with acid-resistant brick.

Existing agitation equipment will be obtained from the recently purchased, Goodrich-Gulf Plant at Institute, West Virginia. The first-stage agitator shaft and impeller will be replaced using Hastelloy C material. The pH of the wastewater will be near neutral in the second stage, and the existing stainless-steel shaft and impeller will be used.

Controls for the neutralization system will be designed for wastewater flows from 1,000 to 4,700 gpm and HCl content from 0.03 to 2.0 percent. The rangeability of the controls will be 300 to 1. The first neutralization stage will be controlled with a feed-forward instrument system utilizing an automatic, on-stream titrator recently developed by UCC. The titrator measures percentage acidity, and at low pH values has an advantage over instruments that measure pH. This advantage results from measuring a linear variable (acidity) instead of a logarithmic variable (pH). The second neutralization stage will be controlled by a feedback instrument system based on pH measurement.

In the event of a low pH effluent from the neutralizer, the process sewer effluent will be diverted automatically to existing, lime pits that discharge to Sugar Camp Run. This capability is required to protect the clarifi-

PROCESS FACILITIES DESCRIPTION (Cont'd)

Process Sewer Neutralization (Cont'd)

cation system from acid wastewater. The pH of effluent from these pits will be maintained at 5 to 9 by the on-stream titrator or by a manual lime feed system. However, the removal of floatable and settleable solids will not be accomplished by settling in the pits to the same degree that will be obtained by clarification. This scheme of emergency operation is temporary and will be needed infrequently. The frequency is related to the mechanical reliability of the neutralization and clarification system.

Eventually, the process sewer effluent will be diverted to a holding basin planned for Phase III. This basin will impound the effluent for several hours and will be provided with pumping equipment to return the effluent to the neutralization system.

Lime Storage and Slurry Preparation

Lime usage will increase to approximately 15 tons per day by 1975 from a current two to three tons per day. This increased usage will require bulk storage of solid lime rather than storage of the current 20 to 25 percent lime slurry. In addition, the economics are attractive for purchasing solid lime in the form of calcium oxide (pebble lime) and then slaking to calcium hydroxide (lime hydrate) rather than purchasing lime hydrate, as is currently done.

Pebble lime will be delivered by truck and unloaded pneumatically into a new, 150-ton, bulk-lime concrete silo. Delivery by truck is preferred, because the unloading operation will be performed by the truck driver. The trucks are equipped with conveying equipment for unloading and will deliver 20 tons of lime per load. Because of the location of the Plant, the delivery cost of lime by rail or truck is essentially the same.

An existing pneumatic unloading system with a capacity of approximately eight tons per hour of lime hydrate is available for emergency rail-car unloading. The system has been reviewed with a reputable manufacturer (Fuller) of pneumatic conveying equipment and is considered suitable for unloading pebble

PROCESS FACILITIES DESCRIPTION (Cont'd)

Lime Storage and Slurry Preparation (Cont'd)

lime. A performance test of the unit will be made to verify the capability of unloading pebble lime. No funds are included in this project for modifications to the system, but funds will be included in Phase III if modifications become necessary.

Pebble lime from the silo will be fed by a gravimetric belt feeder into the slaker where water is added to form a lime-hydrate paste. As the paste leaves the slaking chamber into a second chamber, a controlled flow of water will be added to produce a 20 percent lime slurry. Grit from the slaking operation will be removed from the second chamber and automatically conveyed to a dumpster. The grit will be used as a road-surface topping or as inert material for landfill.

Lime slurry will flow by gravity from the slaker into a small tank (one hour holdup). From this tank, the slurry will be pumped to an existing, 15,000-gallon, stirred, storage tank or directly to the usage points. The capacity of this tank is equivalent to one day's usage at the average 1975 requirements and will provide the inventory to handle peak requirements. Peak usage rates will be required to control: (1) sudden increases in the acid concentration of the process sewer effluent caused by HCl spills, and (2) periodic receipt of up to ten times the average quantity of chlorosilane residues.

From the 15,000-gallon storage tank, the lime slurry will be pumped continuously through a pipeline loop to all slurry usage points. A new, slurry feed pump will be provided, and an existing slurry pump will be used as a spare.

Clarification

The objective of the clarification system will be to remove insoluble oils and settleable and floatable solids from the neutralized wastewater. A pilot-scale clarifier is currently being operated at the Sistersville Plant to evaluate process alternatives that include: (1) gravity separation, (2) chemical

PROCESS FACILITIES DESCRIPTION (Cont'd)

Clarification (cont'd)

flocculation, and (3) air floatation. To date, these tests have not shown that the addition of flocculation or air-floatation equipment to a gravity clarifier is worth the additional investment of approximately $150,000 for each alternative. Therefore, to minimize investment for this project, the design of the system will be based on gravity separation, but with layout consideration for the future addition of flocculating and/or air-floatation equipment. The system will be designed for a wastewater flow of 3,000 gpm, the expected 1975-76 flow. An additional clarifier may be required to provide the capacity for the estimated 1980 flow.

The neutralized wastewater will enter a sump to control the flow to two parallel clarifier basins. Two basins will be required to provide the desired removal of oils and solids and to provide the operating reliability. Each basin will measure 20 feet wide by 100 feet long by 11 feet deep, and the basins will share a common wall. As the wastewater flows through the basins, the heavy solids will settle to the bottom, and the light solids and oils will float to the surface. A scraping mechanism will push the settleable solids to a sump at the influent end of the clarifier. A skimming mechanism will convey the floatables to a skimmer pipe at the effluent end. These solids will be pumped as a slurry on an automated, adjustable time cycle to the sludge ponds, provided by this project, for dewatering.

The effluent from each clarifier basin will be combined and discharged through an outfall to Sugar Camp Run. This outfall, temporary until secondary treatment facilities are installed (Phase III), will be monitored for turbidity, total carbon, and chlorides.

Sludge Dewatering

Sludge will be collected from the clarification system and the chlorosilanes neutralization system. The total sludge collected (dry basis) will be approximately 9 tons per day initially and 24 tons per day by 1980. Sludge will be transferred by above-ground piping from these systems to two, existing lime ponds.

PROCESS FACILITIES DESCRIPTION (Cont'd)

Sludge Dewatering (Cont'd)

The ponds must be revised by dredging and by lining with an impervious barrier (clay). Also, an underdrain system of perforated polypropylene pipe will be provided at the bottom of the ponds. The pipe will be encased in a layer of gravel and topped with sand to provide a filter medium. In addition, provisions will be made to decant water into the underdrain piping.

The sludge will be dewatered in the modified ponds. The underflow filtrate will flow by gravity to the process sewer. Solids will be periodically removed from the ponds (approximately three times per year initially and six times per year by 1980) and hauled to the chemical landfill being defined as a separate project.

Process Sewer Collection and Utilities Distribution

These facilities are described under the sections Pollution Control and Utilities.

Process Risks

The clarifiers have been defined on the basis of laboratory test data and "state of the art" hydraulic design. These data are now being checked in a rented pilot-scale clarifier at the Sistersville Plant.

Because the Sistersville Plant is composed of batch-type and continuous facilities that produce multi-products, a wide variation exists in wastewater flow and in the amount and types of silicone oils and solids in the wastewater. Therefore, the pilot clarifier data have been difficult to correlate, and certain types of solids and/or oils in the wastewater composite sample passed through the pilot clarifier have been difficult to remove.

Conservative design parameters have been used to size the gravity-type clarifier to provide reasonable probability that the solids and oils will be removed. During the initial operation of the clarification system, an evaluation program will be developed to determine the performance and adequacy of the system. Provisions have also been made in the layout of the system for the addition of air-floatation and/or flocculation equipment, if operating experience indicates the need.

PROCESS FACILITIES DESCRIPTION (Cont'd)

Other Projects

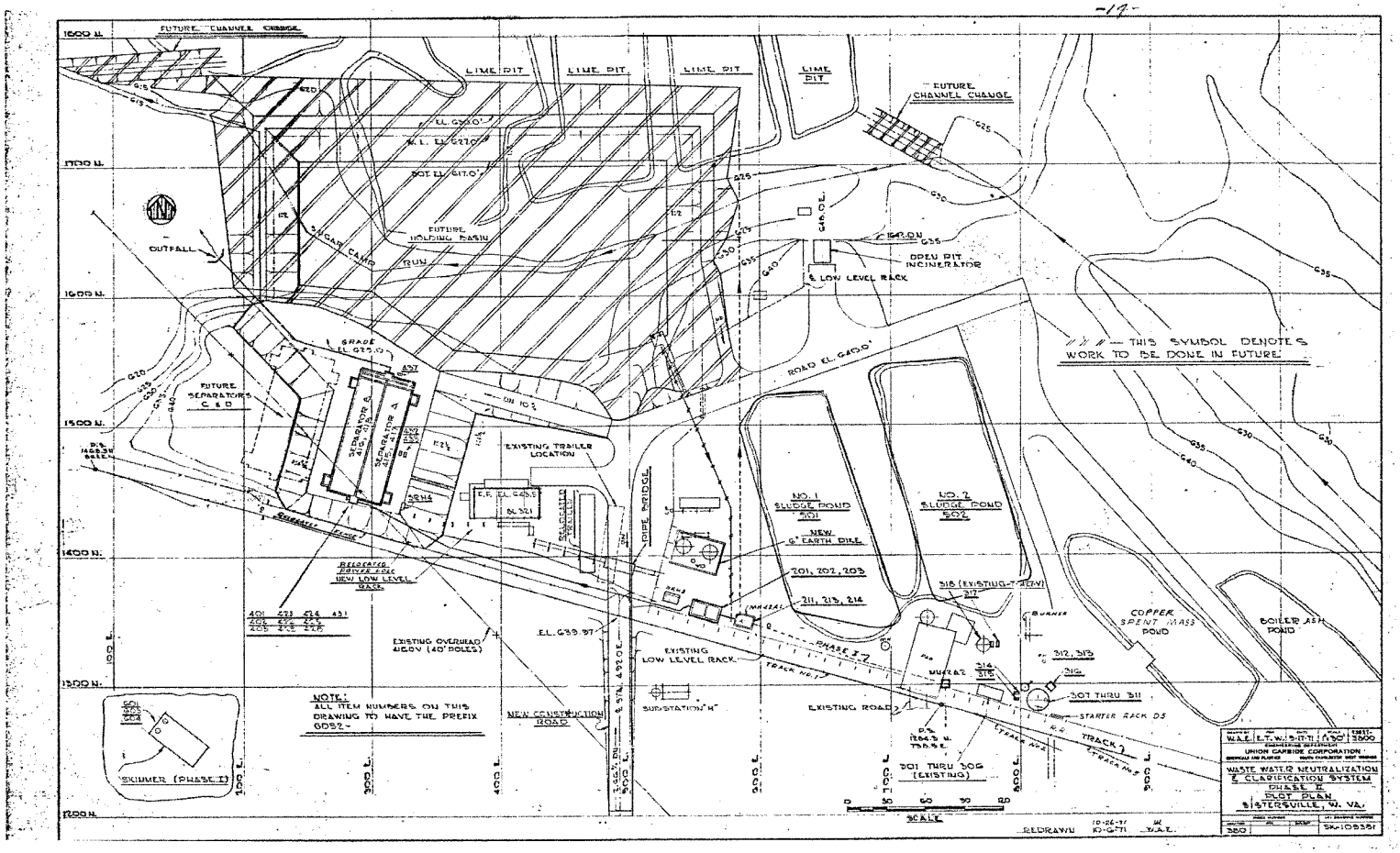
Copper Disposal Project

Plant Engineering is now defining a project to collect and neutralize several copper containing wastes from the Sistersville Plant. The effluent from facilities installed to treat copper wastes will be discharged to the new process sewer.

These Phase II facilities have been defined on the basis that the copper disposal project will discharge a neutral effluent with low copper, low zinc, and low settleable solids content. A study is being made, however, to define what facilities could be shared by the copper waste treatment project. This study will be completed by December 1971. No change in scope for the Phase II project is expected to result from the sharing of facilities, because some excess capacity will exist in the Phase II facilities for the next three to five years.

Chemical Landfill Project

A chemical landfill project for the Sistersville Plant is now being defined by Plant Engineering. This landfill will be used to dispose of solid chemical wastes, presently being buried in the waste treatment area, and of sludge removed from Phase II dewatering ponds. Completion of this landfill project should not be later than four months after start-up of the Phase II facilities. Failure to meet this schedule will require continued disposal of solids in the northwest portion of the waste treatment area, and leaching of organics and chlorides into Sugar Camp Run will continue.



SISVIL014470

EPA005514

CONTROL SYSTEMS

The new facilities provided by the project will be operated from the recently completed control building (Building 321) in the waste treatment area.

Control systems will be provided to minimize use of operators and to protect the steel equipment downstream of the neutralization system from corrosion. All instruments will be electronic and will match the Phase I instruments.

The basic, control systems facilities will be:

1. Panel-mounted instruments for 7 control loops and 16 indicating loops.
2. Panel-mounted instruments (supplied by the vendor but modified by UCC) to control the lime slaking equipment.
3. Field-mounted instruments for three control loops.
4. A cabinet for alarm trips and cable interfaces.
5. A new 21-point annunciator for 18 alarms.

The special, control systems facilities will be:

1. A new Total Carbon Analyzer for analyzing composite samples collected during operation of Phase I and Phase II.
2. A revised Total Carbon Analyzer for monitoring effluent from the separator and the process sewer outfall installed as a part of Phase I.
3. A composite sampler for the separator effluent.
4. An automatic titrator in the feed-forward control system for the neutralizer.

Detailed, control systems requirements are described in the Appendix Report.

ELECTRICAL SYSTEMS

Waste Treatment Area

Electric power for the waste treatment area will be supplied from existing Substation "H" near the area. Spare capacity is available from this substation to provide the requirement of approximately 100 KVA at 480 volts.

ELECTRICAL SYSTEMS (Cont'd)

Waste Treatment Area (Cont'd)

The basic electrical facilities to be provided are:

1. Two switchracks.
2. Power feeders from Substation "H" to the above switchracks.
3. Nineteen motor circuits.
4. An instrument-power panelboard and transformer for Building 321.
5. Three pole-mounted area-lighting assemblies.

No additional telephone or communications systems will be required for this project. An overall review of these systems will be made, and any necessary additions will be provided in Phase III.

Plant Area

Electric power for the storm-sewer skimmer area will be supplied by a new feeder cable from Substation "D" to an extension of the existing switchrack. The power will be required for two, new 75 hp pumps to be used for pumping process water and fire water from the skimmer to the waste treatment area.

Detailed electrical systems requirements are described in the Appendix Report.

UTILITY REQUIREMENTS

The utility requirements for this project can be supplied without adding new basic generating facilities. However, the waste treatment area will require additional process water, steam, and air service headers. Existing nitrogen and well water (sanitary) headers will be adequate.

The steam and air requirement will be provided by converting an existing steam line to air service and installing a new, larger, steam distribution header. The process water will be obtained by installing two new

UTILITY REQUIREMENTS (Cont'd)

pumps at the Phase I storm-sewer skimmer to pump effluent from the skimmer through existing water headers to the waste treatment area. This water supply will also be used as the source of fire water for the waste treatment area.

Utility requirements for these facilities are:

	Annual	Average	Maximum
Plant Air	31,500 MSCF	3,600 SCFH	10,800 SCFH
Instrument Air	10,500 MSCF	1,200 SCFH	1,200 SCFH
Nitrogen	880 MSCF	100 SCFH	1,000 SCFH
Process (Recycled) Water	21 MM-GAL	40 GPM	130 GPM
150 psig Steam	3 MM-LB	350 LB/HR	700 LB/HR

GENERAL FACILITIES

Roads

Approximately 700 feet of access road will be provided by this project. Avenue B will be extended north into the waste treatment area and to the clarifier located west of Building 321. The existing roadway on the north side of the sludge ponds will be improved. These roads will be permanently surfaced with asphalt after construction of Phase III.

Fencing

The existing chain link security fence (approximately 1,000 feet), separating the waste treatment area from the main plant, will be removed as required during construction and replaced as construction is completed.

Most of the existing fence (approximately 3,000 feet), surrounding the waste treatment area, is a "cattle-type" fence and not a "security-type" fence. This project will provide one additional strand of barbed-wire to this existing fence.

Buildings

The existing control building (Building 321) will be adequate for Phase II additions. An existing trailer, located east of the building, will be moved about 20 feet to the west and used for temporary office space.

GENERAL FACILITIES (Cont'd)

Laboratory

Additional laboratory equipment will be required for Building 321. This equipment will include:

1 - Balance
1 - Culture Oven
1 - "Hach" Wastewater Test Kit
4 - Imhoff Cones, with stands

The existing laboratory space in Building 321 will be adequate for this new equipment.

The main plant-laboratory will continue to be used for special analysis work. No additional space or equipment will be required at this laboratory.

Miscellaneous Operating Equipment

Sample Van

A van-truck will be provided to collect wastewater samples from sampling equipment installed on this project and on Phase I. This truck will collect approximately 13 samples daily from locations in the plant, in the waste abatement area, and at the outfall of Sugar Camp Run near the Ohio River.

Spare Parts

Capitalizable spare parts, estimated to cost $4,000, have been included in this project. A review of plant stores will be made to prevent the duplication of parts and to minimize investment.

SAFETY AND FIRE PROTECTION

Attention has been given to all aspects of process, equipment, and personnel safety to ensure that the project meets Corporate safety objectives as well as applicable State and National standards. A safety review of the project will be made by an engineer not associated with the project, and a Safety Considerations Report will be issued prior to completion of the project.

SAFETY AND FIRE PROTECTION (Cont'd)

The primary hazards will be from combustible wastes and explosive gases that might be in the sewer. Organic wastes from spills could be present throughout the process sewer and the design of Phase II facilities will be based on this possibility.

Hydrogen gas will evolve during neutralization when silanic hydrogen-containing wastes are present in the sewer. This situation will be localized at the process-sewer neutralization system and the chlorosilanes neutralization system. Adequate precautions will be taken in the design of these systems to protect personnel and equipment.

All of the above-grade operating areas within 50 feet of sources of flammable vapors will be classified Class I, Group D, Division 2. All below-grade pits will be classified Class I, Group D, Division 1. Other areas of the facility will be classified non-hazardous.

Detailed safety and fire protection provisions are described in the Appendix Report.

POLLUTION CONTROL

A sewer system will be installed in the waste treatment area to collect wastewater from Building 321, from the existing waste oil storage tanks, from the existing chlorosilanes neutralization equipment, and from the new lime facilities. This wastewater will be directed to the plant process sewer for treatment.

Effluent from the septic tank that receives sanitary waste from Building 321 will also be discharged to the process sewer.

Solid residues from the sludge dewatering system will be hauled to a chemical landfill facility for disposal. The landfill facility will be designed and operated in accordance with current State regulations and will be provided on a separate project.

POLLUTION CONTROL (Cont'd)

HCl fumes are generated during operation of the existing, batch, chlorosilanes neutralization system. Equipment will be provided by this project to control air pollution caused by these fumes.

Baghouse filters will be provided on the lime storage silo to control the discharge of dust to the atmosphere.

MANPOWER AND COST

Manpower

The additional facilities provided by this project will require "round-the-clock" attention. Currently, the waste treatment area operates only two shifts per day and has a foreman on the day shift only. Staffing of a third shift with complete foremen coverage will require the following additional personnel:

1. Three hourly employees.
2. A day-shift technician at Building 321.
3. Three foremen.

No additional technical manpower will be required. However, one technical man has been added to the plant EPC Group during preparation of this DOF report.

Cost

Estimated operating costs for the waste treatment area after these Phase II facilities are in operation are as follows:

	Thousand of Dollars		
	Water Treatment (40 Percent of Total)		
	Before Phase II (1972)	After Phase II (1975)	Total Waste* Treatment (1975)
Operating Labor	36	72	180
Supervision	12	12	30
Maintenance	60	145	360
Other Period Costs	46	60	150
Sub-Total	154	289	720
Lime	50	150	150
Utilities	2	4	10
Total Operating Cost	206	443	880

*Includes water, air, and incineration costs but does not include Phase III facilities.

ESTIMATE SUMMARY

Capital Investment

A Commitment-Expenditure Forecast of the capital investment for this project is included on Page 26.

Estimates of the capital investment are:

Material	$ 419,000
Equipment	113,000
Field Labor	266,300
Construction Overhead	292,200
Engineering	275,000
Contingency	164,500
Total	$1,530,000

The estimates are of plus or minus 10 percent accuracy and are shown in greater detail in the Investment Estimate sheets (Pages 29 through 34).

Material

Material costs were developed from preliminary engineering studies, process flow diagrams, and layout drawings. These costs have been escalated for purchases to be made in 1972.

The cost of material for lining the sludge ponds is based on a sufficient amount of material (clay) being available within the boundaries of the plant. Preliminary investigations indicate that clay is available.

Equipment

Equipment costs were obtained from UCC estimating manuals, commodity files, and preliminary vendor quotations. These costs include freight and have been escalated for purchases to be made in 1972.

Field Labor

Field labor costs are based on construction being performed in 1972. The costs are based on labor productivity factors developed from recent construction experience at the Sistersville Plant. No allowance was made for overtime.

ESTIMATE SUMMARY (Cont'd)

Construction Overhead

Construction overhead includes labor burden costs, location overhead costs, and general-administration (Construction Department management) overhead costs. Also, construction overhead includes a per diem allowance for construction personnel temporarily located at Sistersville.

Engineering

Engineering costs include DOF engineering, post-CBP engineering, and start-up engineering.

Engineering manpower requirements were estimated by each engineering function involved in the project. These requirements and manpower expended for the DOF were used in determining total engineering costs.

Contingency

A 12 percent contingency allowance was used in developing the total estimate.

Non-Capital Expenditures

The non-capital expenditures for this project are:

1.	Relocate security fencing in waste abatement area during construction	$ 700
2.	Dredge existing neutralization ponds	2,000
3.	Relocate light poles and trailer	400
4.	Revise existing chlorosilanes neutralization facilities.	6,100
5.	Equipment rental, overhead, engineering, and contingencies.	6,800
		$16,000

PROJECT PLAN

Responsibility

The following project team assignments have been made:

Project Manager	J. F. Nelson, Jr.
Environmental Process Engineering Group Leader	W. D. Bradbury, Jr.
Environmental Process Engineers	J. M. Smith
	L. A. Peggs
Cost Engineer	A. I. Henderson
Project Analyst	W. H. Onks
Safety and Fire Protection Engineer	J. M. Poulson
Plant Layout Engineer	E. T. Weber
Civil Design	L. H. Stern
Mechanical Design	O. H. Cooper
Electrical Design	J. R. Cooper
Control Systems Design	J. C. Nelson
Construction Manager	E. C. Shipley
Operating Department Representative	R. H. Neelen

Engineering, Procurement, and Construction

The major portion of engineering and procurement will be performed at the Charleston Engineering Center. Engineering and procurement for revising the existing chlorosilanes neutralization facilities will be performed by the Ohio Valley Plant Engineering Group. A soils engineering firm will be consulted during design and construction of the sludge ponds.

An estimate of UCC engineering manpower is included in the Engineering Schedule and Manpower Forecast on Page 27.

Construction will be primarily by the Kanawha Valley Construction Group and will be performed on a normal work-week basis. Our Construction Group will be the general contractor for work sub-contracted to install the lime storage silo and the sludge ponds. Revisions to the chlorosilanes neutralization system will be by the Maintenance Department at Sistersville or by local contractors.

PROJECT PLAN (Cont'd)

Engineering, Procurement, and Construction (Cont'd)

UCC construction manpower will be apportioned as follows:

MAN-MONTHS - 1972

M	A	M	J	J	A	S	O
14.8	32.2	49.5	62.8	48.5	35.5	25.9	13.5

Schedule

This project will be completed approximately eleven months after the CBP is approved.

The duration of major functions involved in this project are shown in the Summary Schedule on Page 28. This schedule is based on the following assumptions:

1. The CBP will be approved by the first of January 1972.
2. Permission will be granted to continue process engineering uninterrupted after DOF submittal.
3. No equipment or materials will be purchased prior to CBP approval.
4. Engineering and construction manpower will be available as required.
5. Straight-time design and construction effort will be utilized.
6. Only minor delays in construction and in delivery of major equipment will be encountered.

Project Control

Detailed schedules developed to prepare the Summary Schedule, Page 28, and the Engineering Schedule and Manpower Forecast, Page 27, will be used with the monthly Engineering Order Cost Summary to monitor engineering schedules and expenditures.

Detailed schedules developed to prepare the Summary Schedule, and detailed estimates summarized by Investment Estimate sheets, on Pages 29 through 34, will be used to control schedules and expenditures during purchasing and construction.

PROJECT PLAN (Cont'd)

Quality Control and Preoperational Checkout

During construction, a qualified field inspector will be provided to ensure that facilities are installed in accordance with drawings and specifications. An additional inspector with soils testing experience will be provided during construction of the sludge ponds.

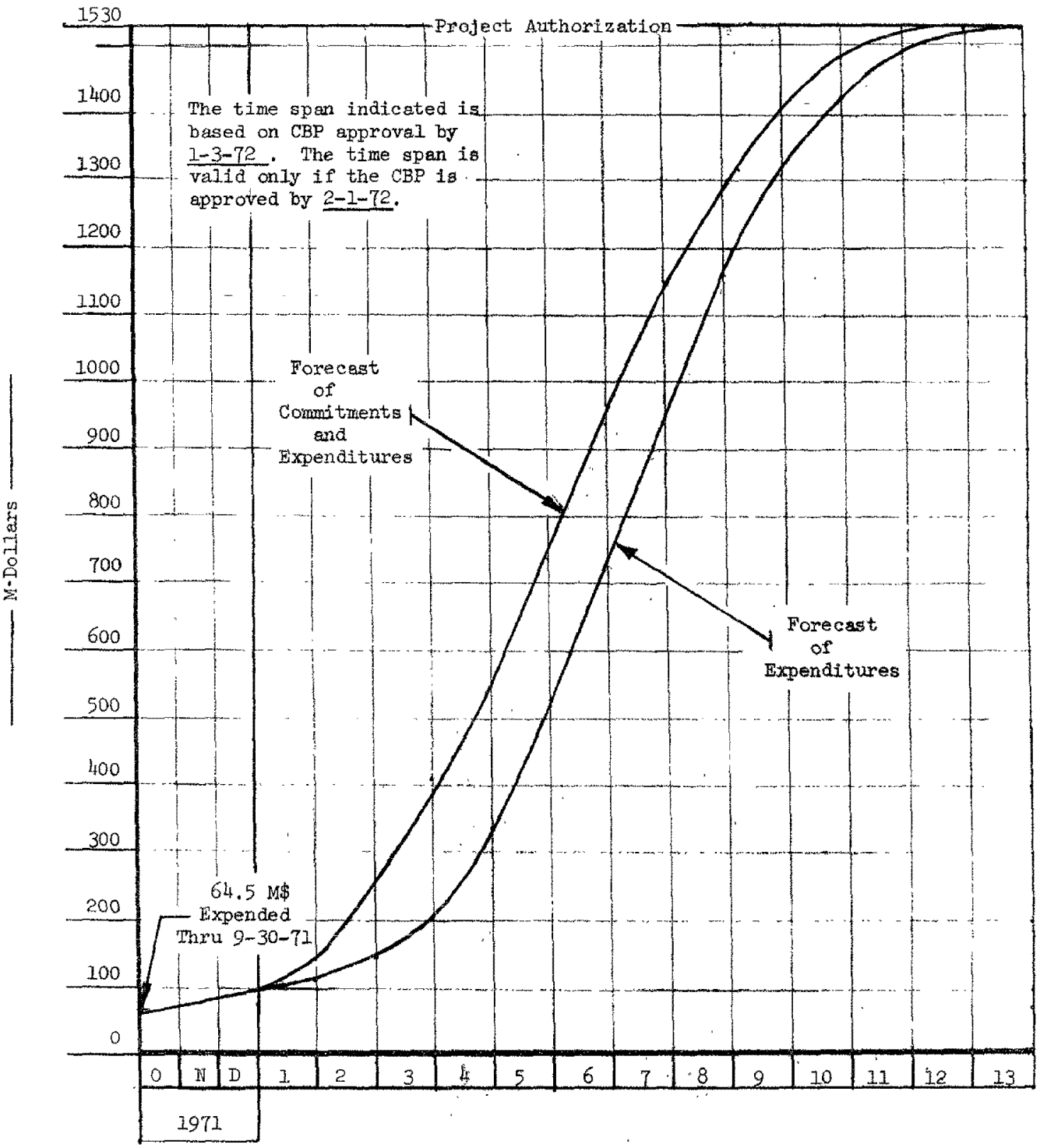
After mechanical completion, personnel from the Engineering Department and the plant Environmental Protection Department will test the performance of safety and fire protection devices, mechanical equipment, and control systems.

COMMITMENT-EXPENDITURE FORECAST

Wastewater Neutralization and Clarification System

- Sistersville Plant -

Anticipated CBP Approval: 1-3-72



11-8-71 Rev.

AIH 11-4-71
WHO

SISVIL014482

EPA005526

WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM
SISTERSVILLE PLANT

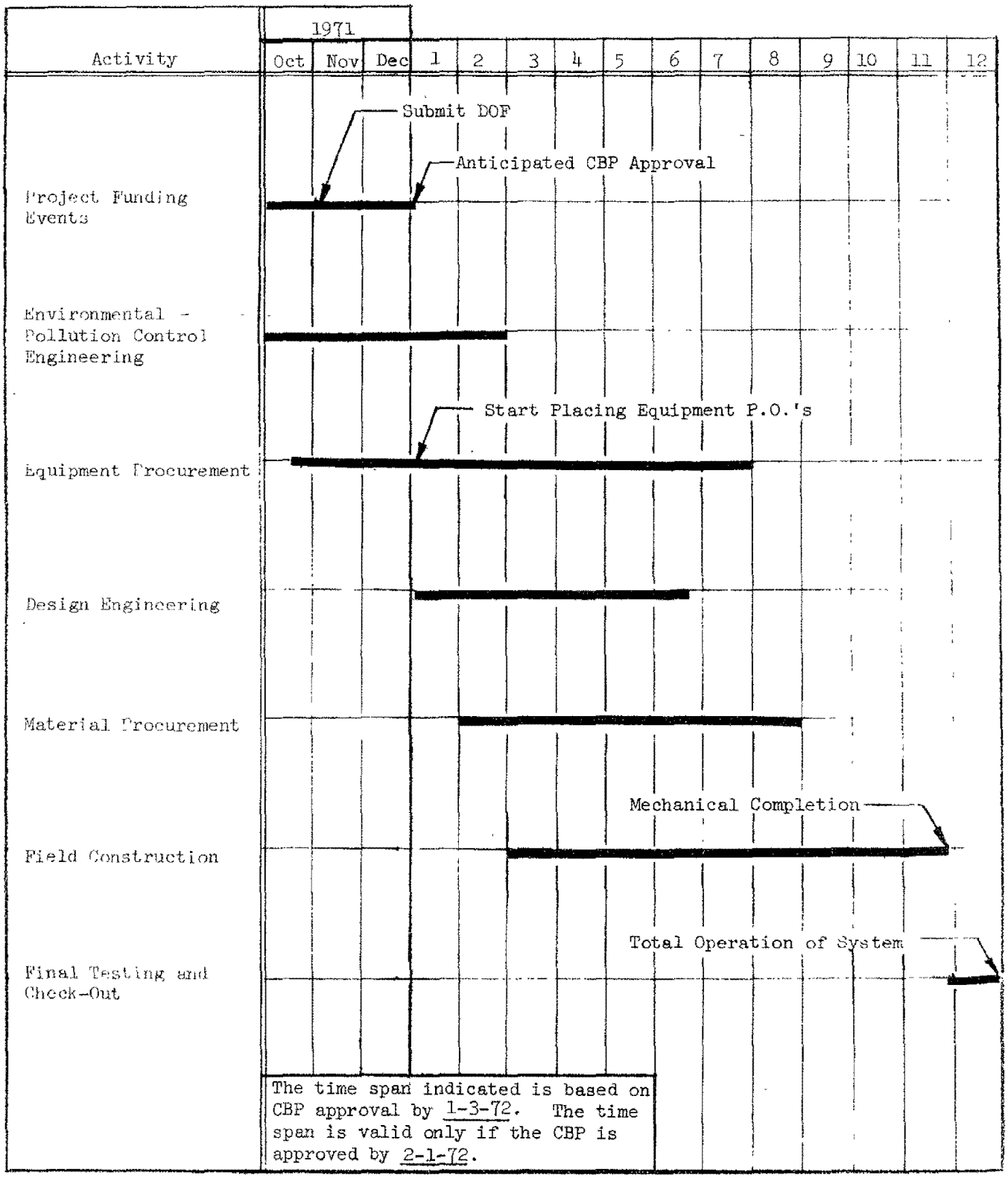
ENGINEERING SCHEDULE AND MANPOWER FORECAST

DISCIPLINE	CC	EXP. THRU 9-30-71 (MAN-MO.)	CLASS	1971 OCT.	NOV.	DEC.	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL EXP. EST. (MAN-MO.)	TOTAL EXP. EST. ($)
MECHANICAL ENG. & DRAFTING	16		E	0.10			1.00	1.00	1.00	1.00										
	20	0.38	N				1.80	1.80	1.20	1.20									10.48	21,500
ENVIRONMENTAL POLLUTION CONTROL ENG.	18	12.70	E	1.32	3.00	2.60	1.60	1.30	0.80	1.20	0.20	0.30	0.20	0.30	0.20	0.80	0.35	0.35		
			N	0.56	0.90	0.90	0.80	0.50	0.40	0.40	0.40	0.40	0.20	0.20	0.20	0.30	0.15	0.15	33.68	74,000
PROJECT MANAGEMENT	18	3.10	E	0.81	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.40	0.30	0.30	0.30	0.40	0.20	0.20		
			N																8.91	24,500
CIVIL ENG. & DRAFTING	19	1.40	E	0.10			0.30	1.70	1.50	1.50	1.00									
			N					1.30	2.80	2.00	2.50	0.20	0.20						16.50	33,800
ELECTRICAL ENG. & DRAFTING	21	0.90	E	0.20				0.50	1.00	0.75	0.30									
			N						0.50	2.00	2.25	0.20							8.60	17,500
CONTROL SYSTEMS ENG. & DRAFTING	24	0.51	E	0.20				0.80	1.70	2.00	0.30					0.20	0.10			
			N						1.50	1.50	1.00	0.60							10.41	23,600
PROCESS SAFETY & FIRE PROTECTION	26	0.43	E				0.30	0.30	0.30	0.20										
			N					0.10	0.10										1.73	4,400
LAYOUT & GENERAL FACILITIES	27	4.20	E	0.30			0.30	0.20												
			N																5.09	11,700
UTILITIES	28	0.15	E				0.20	0.20	0.10											
			N																0.65	1,800
MATERIALS OF CONSTRUCTION	31	0.53	E		0.10		0.20	0.20	0.10	0.10	0.10									
			N																1.33	3,400
EQUIPMENT ENG. & PROCUREMENT	38	0.30	E		0.10		0.20	0.20	0.20	0.10										
			N				0.10	0.10	0.10										1.40	3,400
PURCHASING & CONTRACTING	39	0.02	E							0.30	0.30			0.20	0.20					
			N																1.02	2,800
BILLING & MATERIALS CONTROL	40		E						0.10	0.40	0.50	1.00	0.20	0.20						
			N						0.20	0.20	0.20	0.20	0.20	0.20					3.60	7,200
INSPECTION & EXPEDITING	41		E					0.10	0.10	0.30	0.30	0.30	0.30	0.30	0.10					
			N							0.10		0.10		0.10					2.10	4,600
COST ENGINEERING	55	1.70	E	0.50	0.10		0.10	0.10		0.10		0.10		0.20			0.20			
			N	0.20															3.30	6,350
OHIO VALLEY PLANT ENGINEERING	57	0.01	E	0.20			0.20	0.30	0.20	0.10						0.10	0.10			
			N						0.50	0.50									2.21	4,900
MEASUREMENT DEV. & SPEC. INSTR. DES.	78	0.16	E						0.50	0.50					0.20	0.20	0.10			
	79		N						0.20	0.20					0.20	0.20			2.46	5,700
PROCESS CONTROL & SIMULATION	80	0.10	E	0.08																
			N																0.18	600
PLANNING & SCHEDULING	95	1.80	E	0.50	0.20		0.10		0.10		0.10									
			N	0.20					0.10		0.10								3.20	8,000
MACHINERY RELIABILITY	42		E					0.10	0.10											
			N																0.20	600
SUB-TOTAL																				260,350
MISC. @ 5%																				14,650
TOTAL																				275,000

SUMMARY SCHEDULE

WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM

- SISTERSVILLE PLANT -



11-2-71 WHO
REV. 11-8-71
REV. 11-9-71

SISVIL014484

EPA005528

ACCT	DESCRIPTION	ESTIMATE BASIS	LABOR		MATERIAL	TOTAL
			MANHOURS	$	$	$
4000	PER DIEM	UCC CONST. DEPT.	—	—	100000	100000
5100	EQUIPMENT INSTALLATION	COST ENG EST.	1440	7700	3000	10700
5200	SITE PREPARATION	"	240	1300	10000	11300
5180	CAPITALIZABLE SPARE PARTS				4000	4000
5216	No. 1 & 2 SLUDGE PONDS	ENV. ENG. GROUP	824	4400	14300	18700
5230	ROADS	CIVIL DES. GROUP	—	—	2000	2000
5265	UNDERGROUND PROCESS SEWERS	ENV. ENG GROUP	3427	18400	36300	54700
5266	MANHOLE	"				
5267	EXCAVATION FOR PROCESS SEWERS	COST ENG. EST.	1600	8500	2500	11000
5290	SHEET PILING & BRACING	"	2160	11600	20000	31600
5345	EQUIPMENT FOUNDATIONS	CIVIL DES. GROUP	852	4600	3700	8300
5375	NEUTRALIZATION PIT	"	2964	15800	10000	25800
5580	LABORATORY EQUIPMENT		-	-	2000	2000
5376	SEPARATOR BASINS A & B	"	13332	71300	46300	117600
5401	STRUCTURAL STEEL	"	538	2900	6700	9600
5470	PIPE SLEEPERS & SUPPORTS	COST ENG EST.	400	2200	2000	4200
5610	SHOP FABRICATED PIPE	"	-	-	22100	22100
5615	PIPING	ENV. ENG GROUP	2923	16400	19800	34200
5655	STEAM TRACING	"	1522	8200	3800	12000
5658	ELECTRIC TRACING	ELEC DES GROUP	160	900	900	1800
5701	INSTRUMENTS	CONTROL DES GROUP	5450	27000	65200	92200
5810	POWER WIRING	ELEC DES. GROUP	2085	11200	18200	29400
5812	POWER FEEDERS	"	5198	27800	17000	44800

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS
ESTIMATE SUMMARY

COE-100 Rev. 6-'70

TITLE	SHEET NO.	DATE
WASTEWATER NEUTRALIZATION AND CLARIFICATION SYS. - PHASE II	1	11/9/71
	LOCATION 380	REQUEST NO. 511-380-126
ESTIMATE TYPE: SISTERSVILLE PLANT	COST ENGINEER	ORDER NO. 230-

-29-

ACCT	DESCRIPTION	ESTIMATE BASIS	LABOR		MATERIAL	TOTAL
			MANHOURS	$	$	$
5821	LIGHTING CIRCUITS	ELEC. DES. GROUP	995	5400	8700	14100
5901	INSULATION - PIPE	COST ENG. EST.	1263	6800	5500	12300
5911	INSULATION - EQUIPMENT	"	172	900	900	1800
6100	PAINTING	"	768	4100	1000	5100
7000	EQUIPMENT RENTAL	% OF LABOR			60800	60800
7050	FIELD PROJECT CONTROL	COST ENG. EST.		5100		5100
6001	FIRE PROTECTION	PROC. SAFETY GROUP	530	2900	2500	5400
5660	UNDERGROUND FIRE WATER LINE	"	526	2800	3500	6300
5616	REVISIONS TO CHLOROSILANES NEUTRALIZATION SYS.	BY PLANT			25000	25000

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS
ESTIMATE SUMMARY

COE-100 Rev 6-'70

TITLE	SHEET NO.	DATE
WASTEWATER NEUTRALIZATION AND CLARIFICATION SYS - PHASE II	2	11/9/71
	LOCATION 380	REQUEST NO. 511-380-126
ESTIMATE TYPE	COST ENGINEER	ORDER NO.
SISTERSVILLE PLANT	TT	930-

-30-

ACCT	DESCRIPTION	ESTIMATE BASIS	LABOR		MATERIAL	TOTAL
			MANHOURS	$	$	$
202	(2) No. 1 NEUTRALIZATION PIT AGITATOR	VENDORS			7700	7700
211	(1) SAMPLE PUMP	QUOTES & INVEST.			1900	1900
213	(2) SLUCE GATE OPERATORS	MANUAL			3000	3000
307	BULK LIME STORAGE BIN	"			17100	17100
308	FILTER RECEIVER	"			1000	1000
309	SLIDE GATE VALVE	"			600	600
310	GRAVIMETRIC BELT FEEDER	"			15000	15000
312	LIME SLURRY HOLD TANK	"			1000	1000
313	AGITATOR	"			600	600
314	(2) LIME SLURRY FEED PUMPS	"			2600	2600
316	GRIT DUMSTER	"			500	500
317	LIME SLURRY CIRCULATING PUMP	"			1900	1900
318	EXISTING LIME SLURRY STORAGE TANK	"	19	100	100	200
417	SEPARATOR EQUIPMENT	"			43000	43000
432	(2) SLUDGE PUMPS No. 1 & 2	"			2400	2400
437	SAMPLE PUMP	"			1900	1900
603	(2) RECYCLE WATER PUMPS	"			10000	10000
605	SAMPLE TRUCK	"			4000	4000

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS
ESTIMATE SUMMARY

COE-100 Rev. 6-'70

TITLE	SHEET NO.	DATE
WASTEWATER NEUTRALIZATION AND CLARIFICATION SYS. - PHASE II	3	11/9/71
	LOCATION 380	REQUEST NO. 511-380-126
ESTIMATE TYPE	COST ENGINEER	ORDER NO.
SISTERSVILLE PLANT		

ACCT	DESCRIPTION	ESTIMATE BASIS	LABOR		MATERIAL	TOTAL
			MANHOURS	$	$	$
	SUBTOTAL - DIRECT LABOR AND MATERIAL		48988	266300	632000	898300
	FIELD INSPECTION					22000
6999	LABOR BURDEN 25% x L (NOTE 1)					66600
9702	LOCATION OVERHEAD 35% x L (NOTE 2)					93200
9900	GENERAL ADMINISTRATION OVERHEAD 1% (NOTE 3)					10400
	SUB TOTAL					1092500
8066	DEFINITION OF FACILITIES - ENGINEERING (NOTE 4)					95000
8067	POST CBP ENGINEERING - UCC (NOTE 5)	53 MM(E)				170000
8068	POST CBP ENGINEERING - CONTRACTOR (NOTE 5)	36 MM(NE)				
8069	STARTUP ENGINEERING (NOTE 6)					10000
8070	COMPUTER PROGRAMMING					
	SUBTOTAL - DIRECT AND INDIRECT COSTS					1365800
9999	CONTINGENCIES (NOTE 7)					164500
	TOTAL ESTIMATE					1530000

NOTES:
1. LABOR BURDEN INCLUDES EMPLOYER'S CONTRIBUTION TO FICA, WORKMEN'S COMPENSATION, OTHER PAYROLL TAXES AND INSURANCE, "SHOWUP" PAY, CRAFT TRAVEL, CRAFT FRINGE BENEFITS, HOLIDAY PAY, AND OTHER UNION FRINGES, AS APPLICABLE TO FIELD LABOR.
2. LOCATION OVERHEAD INCLUDES INDIRECT COSTS INCURRED BY UCC AND THE CONTRACTOR (IF APPLICABLE) AT THE FIELD LOCATION INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING ACTIVITIES: GENERAL SUPERVISION, CRAFT SUPERVISION, TIME KEEPING, FIELD PURCHASING, FIELD ACCOUNTING, WAREHOUSING AND MATERIAL CONTROL, TEMPORARY BUILDINGS, TEMPORARY UTILITIES, AND UNALLOCABLE CONSTRUCTION LABOR SUCH AS WELDER QUALIFICATION, WATCHMEN, JANITORS, ETC.
3. GENERAL ADMINISTRATION OVERHEAD INCLUDES ENGINEERING DEPARTMENT CONSTRUCTION MANAGEMENT NOT ASSIGNABLE TO SPECIFIC LOCATION, AND OTHER CONSTRUCTION AND INSPECTION COSTS WHICH CANNOT BE ASSIGNED TO A SPECIFIC PROJECT OR SPECIFIC LOCATION.
4. DEFINITION OF FACILITIES ENGINEERING IS THE COST OF PRELIMINARY ENGINEERING REQUIRED TO COMPLETELY DEFINE THE FACILITIES AND PREPARE AN APPROPRIATION QUALITY ESTIMATE OF COST.
5. POST-CBP ENGINEERING INCLUDES THE COST OF BOTH UCC AND CONTRACT ENGINEERING FROM COMPLETION OF THE DOF THROUGH PHYSICAL COMPLETION OF THE PROJECT.
6. STARTUP ENGINEERING INCLUDES THE CAPITALIZABLE COST OF THE ENGINEERING SERVICES FROM PHYSICAL COMPLETION THROUGH SUCCESSFUL OPERATION OF THE PROJECT AS DEFINED IN THE DOF REPORT.
7. CONTINGENCIES ARE ALLOWANCES FOR UNDEFINED AND UNFORESEEABLE DEVIATIONS FROM THE IDEAL PROGRESS OF THE JOB. EXAMPLES OF ITEMS WHICH MAY BE COVERED BY CONTINGENCIES ARE THE COSTS CAUSED BY: UNFORESEEN FIELD CHANGES WITHIN ORIGINAL PROJECT SCOPE, CONSTRUCTION PROBLEMS, STRIKES, DELAYS IN MATERIAL DELIVERY, FORCE MAJEURE, ETC. CHANGES IN SCOPE ARE SPECIFICALLY EXCLUDED.

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS
ESTIMATE SUMMARY

COE-101 Rev 6 - '70

TITLE	SHEET NO.	DATE
WASTEWATER NEUTRALIZATION AND CLARIFICATION SYS. PHASE II	4	11/9/71
	LOCATION 380	REQUEST NO. 511-380-126
ESTIMATE TYPE	COST ENGINEER	ORDER NO.
SISTERSVILLE PLANT		930

ACCT	DESCRIPTION	ESTIMATE BASIS	LABOR		MATERIAL	TOTAL
			MANHOURS	$	$	$
5205	REVISE CHLOROSILANES NEUT. SYS.		766	4100	2000	6100
5225	REMOVE FENCING		72	400	300	700
5275	DREDGING - CLEANING SLUDGE PONDS		-	-	2000	2000
5821	RELOCATE LIGHT POLES		60	300	100	400
9000	EQUIPMENT RENTAL				1000	1000

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS
ESTIMATE SUMMARY

COE-100 Rev. 6-'70

TITLE: WASTEWATER NEUTRALIZATION AND CLARIFICATION - PHASE II - EXPENSE		SHEET NO. 1	DATE 10/5/71
		LOCATION 380	REQUEST NO. 126
ESTIMATE TYPE	SISTERSVILLE PLANT	COST ENGINEER	ORDER NO. 15-

ACCT	DESCRIPTION		ESTIMATE BASIS	LABOR MANHOURS	LABOR $	MATERIAL $	TOTAL $
	SUBTOTAL - DIRECT LABOR AND MATERIAL			898	4800	5400	10200
6999	LABOR BURDEN 25%	(NOTE 1)					1200
9738	LOCATION OVERHEAD 35% L	(NOTE 2)					1700
9900	GENERAL ADMINISTRATION OVERHEAD 1%	(NOTE 3)					100
	Sue Totals						13200
8066	DEFINITION OF FACILITIES - ENGINEERING	(NOTE 4)					
8067	POST CBP ENGINEERING - UCC	(NOTE 5)	PLANT EST.				1000
8068	POST CBP ENGINEERING - CONTRACTOR	(NOTE 5)					
8069	STARTUP ENGINEERING	(NOTE 6)					
8070	COMPUTER PROGRAMMING						
	SUBTOTAL - DIRECT AND INDIRECT COSTS						14200
9999	CONTINGENCIES 10%	(NOTE 7)					1800
	TOTAL ESTIMATE						16000

NOTES:
1. LABOR BURDEN INCLUDES EMPLOYER'S CONTRIBUTION TO FICA, WORKMEN'S COMPENSATION, OTHER PAYROLL TAXES AND INSURANCE, "SHOWUP" PAY, CRAFT TRAVEL, CRAFT FRINGE BENEFITS, HOLIDAY PAY, AND OTHER UNION FRINGES, AS APPLICABLE TO FIELD LABOR.
2. LOCATION OVERHEAD INCLUDES INDIRECT COSTS INCURRED BY UCC AND THE CONTRACTOR (IF APPLICABLE) AT THE FIELD LOCATION INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING ACTIVITIES: GENERAL SUPERVISION, CRAFT SUPERVISION, TIME KEEPING, FIELD PURCHASING, FIELD ACCOUNTING, WAREHOUSING AND MATERIAL CONTROL, TEMPORARY BUILDINGS, TEMPORARY UTILITIES, AND UNALLOCABLE CONSTRUCTION LABOR SUCH AS WELDER QUALIFICATION, WATCHMEN, JANITORS, ETC.
3. GENERAL ADMINISTRATION OVERHEAD INCLUDES ENGINEERING DEPARTMENT CONSTRUCTION MANAGEMENT NOT ASSIGNABLE TO SPECIFIC LOCATION, AND OTHER CONSTRUCTION AND INSPECTION COSTS WHICH CANNOT BE ASSIGNED TO A SPECIFIC PROJECT OR SPECIFIC LOCATION.
4. DEFINITION OF FACILITIES ENGINEERING IS THE COST OF PRELIMINARY ENGINEERING REQUIRED TO COMPLETELY DEFINE THE FACILITIES AND PREPARE AN APPROPRIATION QUALITY ESTIMATE OF COST.
5. POST-CBP ENGINEERING INCLUDES THE COST OF BOTH UCC AND CONTRACT ENGINEERING FROM COMPLETION OF THE DOF THROUGH PHYSICAL COMPLETION OF THE PROJECT.
6. STARTUP ENGINEERING INCLUDES THE CAPITALIZABLE COST OF THE ENGINEERING SERVICES FROM PHYSICAL COMPLETION THROUGH SUCCESSFUL OPERATION OF THE PROJECT AS DEFINED IN THE DOF REPORT.
7. CONTINGENCIES ARE ALLOWANCES FOR UNDEFINED AND UNFORESEEABLE DEVIATIONS FROM THE IDEAL PROGRESS OF THE JOB. EXAMPLES OF ITEMS WHICH MAY BE COVERED BY CONTINGENCIES ARE THE COSTS CAUSED BY: UNFORESEEN FIELD CHANGES WITHIN ORIGINAL PROJECT SCOPE, CONSTRUCTION PROBLEMS, STRIKES, DELAYS IN MATERIAL DELIVERY, FORCE MAJEURE, ETC. CHANGES IN SCOPE ARE SPECIFICALLY EXCLUDED.

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS
ESTIMATE SUMMARY

COE-101 Rev 6-'70

TITLE	SHEET NO.	DATE
WASTEWATER NEUTRALIZATION	2	10/5/71
FINE CLARIFICATION - PHASE II - EXPENSE	LOCATION 380	REQUEST NO 126
ESTIMATE TYPE: SISTER SIZE PLANT	COST ENGINEER #	ORDER NO 50

-34-

UNION CARBIDE CORPORATION

CHEMICALS AND PLASTICS ENGINEERING

SOUTH CHARLESTON, WEST VIRGINIA

DEFINITION OF FACILITIES APPENDIX REPORT

WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM

PHASE II

SISTERSVILLE, WEST VIRGINIA

NOVEMBER 10, 1971

APPENDIX

TABLE OF CONTENTS

SITE DEVELOPMENT AND GENERAL FACILITIES BASIS

Roads

Avenue B will be extended northward to provide a new, direct avenue for traffic between Control Building 321 and the remainder of the plant. This road will cross the existing railroad tracks on the projected centerline of the established road (E492.0). The railroad crossings will be surfaced with pre-cast concrete planks similar to other plant crossings. The top of rail elevation is 640 feet, and the road will descend to this level on a 2.5 percent grade. The road surface will raise on a 2.5 percent grade north of the railroad tracks to reach the existing grade of elevation 641 feet. The road will cross an existing low level pipe rack that will be relocated to a pipe trench. The road will be stabilized with gravel and graded for future surfacing.

Separators Site Development

The location of the separators will require that the ground level be lowered approximately 16 feet to keep the separators above grade. The water level in the separators will be at an elevation of 627 feet, and grade level will be at an elevation of 628 feet. To prepare the site for the separators, approximately 9,000 cubic yards of dirt will be excavated, and one pole in an electric power line will be moved.

The excavated area for the separators will have a 1:2-1/2 slope on the east to within 5 feet of Building 321 air-conditioning equipment; a 1:2 slope on the south to within 10 feet of the railroad centerline; and a 1:1-1/2 slope on the west to present ground level. The north side will be level at elevation 628 feet toward Sugar Camp Run.

A maintenance corridor of 10 feet minimum width will be on the east and west side of the separator basins. The excavated area will be connected to the higher ground north of Building 321 by a 15-feet wide roadway that has a 10-percent uphill slope.

The excavated area will extend northwestward to provide a level route for Phase II temporary effluent pipe and for future continuation of pipe to Phase III facilities.

SITE DEVELOPMENT AND GENERAL FACILITIES BASIS (Cont'd)

Separators Site Development (Cont'd)

The earth slopes around the separator area will be grassed for soil stability. The maintenance roadways will be surfaced with stabilized gravel.

Pipeways

Additional pipelines are required between the lime slurry/sludge pond area and the separator/Building 321 area. Ground space is very limited along the route, and vertical racking of the pipe on posts is planned.

Existing Waste Treatment Operations

Consideration was given to continued operation of the present treatment facilities during the construction of Phase II. The neutralization and separation sites were chosen because, among other things, construction at these sites would not interfere with the present or modified wastewater flow pattern.

DETAILED UTILITY BASIS

The following table summarizes the utility requirements for Phase II:

	Annual	Average	Maximum
Plant Air	31,500 MSCF	3,600 SCFH	10,800 SCFH
Instrument Air	10,500 MSCF	1,200 SCFH	1,200 SCFH
Nitrogen	880 MSCF	100 SCFH	1,000 SCFH
Process Water	21 MM-GAL	40 GPM	130 GPM
Steam	3 MM-LB	350 LB/HR	700 LB/HR

Utility headers into the existing waste treatment area include:

1. Plant and Instrument Air - 1 in. A-619-1
2. Nitrogen - 1-1/2 in. SM-619-1
3. Drinking Water - 3 in. WW-8
4. Recycled Water (fire and process) - 6 in. CW-1

DETAILED UTILITY BASIS (Cont'd)

To meet the increased requirements for Phase II, changes will be made to provide additional steam and air service to the waste treatment area. A new 3-inch steam line will be installed to supply steam for new services as well as existing services. Relocation of existing steam branches in the waste treatment area from the existing 1-1/2-inch to the new 3-inch line will be necessary. This new line will be approximately 1,000 feet long.

The additional air will be supplied by converting the existing 1-1/2-inch steam line to air service. The existing 1-inch air line will remain in service avoiding relocation of existing branches in the waste treatment area.

The capacity of the existing nitrogen header in the waste treatment area is adequate for Phase II facilities.

The existing clean-water supply is adequate for potable water and the additional safety shower and eye-bath station.

To meet the needs for fire water and process water, the recycled water system will be revised. Two new recycle-water pumps, one on-stream and one spare, will be installed at the clean sewer skimming basin installed in Phase I. Water will be supplied from this basin to the waste treatment area for both process and fire water requirements. An existing 6-inch line has been installed by the plant and will require only minor tie-ins to complete the header into the waste treatment area. Provisions have been made for connecting this line to the plant fire water header in an emergency. Existing recycle-water pumps at a sump in the monomers area will be bypassed and will continue supplying the powerhouse recycle-water requirement. The new recycle-water system will supply about 700 gpm of water at about 75 psig to the waste treatment area. This combined process and fire water header has been endorsed by both the plant and engineering safety groups.

DETAILED SAFETY AND FIRE PROTECTION BASIS

Process Safety

The primary process hazards are potential fire problems from immiscible organics that may be present in plant waste streams, from waste flammable liquids

DETAILED SAFETY AND FIRE PROTECTION BASIS (Cont'd)

Process Safety (Cont'd)

stored in the waste treatment area, and from hydrogen formation that might result from neutralizing the process sewer and chlorosilanes wastes. The waste treatment area will be located approximately 300 feet from plant processing areas and 200 feet from the incinerators, the nearest potential ignition source. The location and arrangement of the facilities will be designed to minimize potential fire problems.

All of the above-ground operating areas (such as chlorosilanes neutralization, process sewer neutralization, and process sewer clarification) within 50 feet of possible sources of significant quantities of flammable vapors are classified as Class I, Group D, Division 2 in accordance with the National Electrical Code. All areas below grade (such as trenches, sumps, and pits) are classified as Class I, Group D, Division 1. All other areas of the facility are classified as non-hazardous.

The following process safety features will be provided:

1. A combustible gas detector will be permanently installed in the neutralization pit and in Manhole No. 42A1 to sense a hydrogen gas release and to sound an alarm in the control room of Building 321.

2. The existing waste-solvent tanks will be provided with adequate dikes and curbs to remove potentially hazardous spills.

Fire Protection

The following fire protection facilities will be provided:

1. One standard fire hydrant will be provided per Valve and Piping Specification 36B2. The fire water supply will be from an extension of an existing 6-inch recycle-water line that will be supplied with water pumped from the Phase I skimmer. A hose house will also be provided per Engineering Standard FP-30. The new hydrant and hose house will be located on the east side of Building 321.

DETAILED SAFETY AND FIRE PROTECTION BASIS (Cont'd)

Fire Protection (Cont'd)

Two existing hydrants, one at the chlorosilanes neutralization area and one near the residue burners, are now connected to the recycle-water line. The existing hydrants are currently supplied by a 6-inch water line from a sump pump at the silicones storage building. The new recycle-water supply from the skimmer will use this same header and will provide adequate water at 75 psig.

2. One fire and emergency alarm box will be provided at the chlorosilanes neutralization area. There is an existing alarm box at Building 321.

3. Three dry-chemical, hand, fire extinguishers will be provided for extinguishing incipient fires at the chlorosilanes neutralization, process sewer neutralization, and separator basin areas. There are adequate fire extinguishers existing in Building 321.

4. Fireproofing per Engineering Standard FP-57 is required. for all tank legs at grade in areas where flammable liquids will be stored.

Personnel Safety and Health Hazards

The following personnel safety equipment will be provided:

1. One eye-bath and safety shower station will be provided at the separators. There are adequate stations in all other areas.

2. Personnel protective equipment consisting of face shields, gloves, boots, and protective clothing will be provided for use at the lime storage and neutralization areas. Warning signs will be located at potentially hazardous areas.

3. Guard rails and posts will be provided around the neutralization pit and the separator basins to prevent accidental entry of personnel or vehicles.

DETAILED SAFETY AND FIRE PROTECTION BASIS (Cont'd)

Personnel Safety and Health Hazards (Cont'd)

4. Adequate lighting will be provided to ensure safe operation at all hours of the day.

DETAILED CONTROL SYSTEMS BASIS

The Phase II facilities will be controlled from the existing control room located in Building 321.

The panel-mounted instruments will be electronic (Taylor "Quick-Scan") to match the recorders installed in Phase I. All the panel equipment will be installed in a 30 inch wide by 90 inch high by 36 inch deep free-standing, straight enclosure located east and adjacent to the Phase I enclosure.

A separate alarm-trip and cable interface cabinet will be required and mounted on the north wall of the control room. A new 21-point annunciator will be provided for 18 new alarms and 3 spares.

Modification of controls, supplied by the vendor, on the lime slaking equipment will be required.

Special Instrumentation

A Process Total Carbon Analyzer (UCC Model 1212) will be provided to analyze the composite samples that are collected throughout the plant. This TCA will function as a laboratory model, but will have the flexibility to be used with future Phase III facilities. No external readout, other than the TCA local recorder, will be required. This TCA will be located in the control room, Building 321.

A 10-point, automatic, stream selector will be installed on existing Total Carbon Analyzer GDS-ART-127-1. This TCA will monitor the separator effluent stream as well as the Phase I process-sewer outfall. Equipment to provide a composite sample will also be installed.

DETAILED CONTROL SYSTEMS BASIS (Cont'd)

An automatic titrator (UCC DigiChem Model 1800) will be provided to monitor the acidity of the wastewater from Manhole No. 42A1. The DigiChem will be part of a feed-forward control loop to feed lime slurry to the neutralizer. A sample conditioning system will also be included.

An on-stream, turbidity, measuring system will continuously monitor the separator effluent.

Instrumentation Hardware Summary

1. Panel-Mounted Instruments
   - 7 - Recorded Variables (3-Flow, 1-pH, 1-Speed, 1-Temp., 1-Turbidity)
   - 3 - Indicated Variables (3-Level)
   - 5 - Indicating Controllers (4-Flow, 1-pH)
   - 4 - Special Control Stations
     - 1-Ratio
     - 1-Automatic Timer
     - 1-Summer/Multiplier
     - 1-Integrator
   - 5 - Running Lights
   - 2 - Motor and/or Valve Controls (On/Off)
   - 1 - Solids Level Measurement
   - 18 - Alarm Points
2. Local Controls
   - 2 - Self-Contained Pressure Regulators
   - 1 - Level Indicator with Hi/Lo Alarm for Off/On Control
3. Control Valves

No.	Size	Type	Material
1	1 in.	Ball	Steel
1	1-1/2 in.	DMV	Steel or Cast Iron
4	2 in.	DMV or Ball	Steel
2	3 in.	Ball	Steel

4. Special Devices
   - 1 - Explosion Meter
   - 1 - 3 in. Magnetic Flow Meter
   - 1 - DigiChem Automatic Titrator (By SID)
   - 1 - Laboratory Model TCA (By SID)
   - 1 - "Hach" Turbidity Meter (Model 1861-A)

DETAILED CONTROL SYSTEMS BASIS (Cont'd)

Shutdown System

There are no plans for an automatic shutdown system on this project.

Safety

The only special safety consideration required in the design or use of the control systems is the detection of a potential explosive gas release at the points of lime addition to the process sewer. Combustible gas detection probes will be provided in the neutralization pits and in Manhole No. 42A1.

Utility Requirements for Instruments

Instrument Air	12 SCFM
Air Blowback	20 SCFH
115V 60 HZ Power	2,500 VA

DETAILED ELECTRICAL SYSTEMS BASIS

Electric power for the waste treatment area will be supplied from existing 480-volt Substation "H" which is located south of the waste treatment area in Zone 42 near coordinates E 530 and N 1300. Spare capacity is available to provide project requirements of approximately 100 KVA at 480 volts. The substation currently supplies 480-volt power for two existing outdoor switchracks ("H-1" and "H-2") located in the waste treatment area. Two new switchracks are required. One new switchrack ("H-3") will be located at existing switchrack "H-2" and the back side of existing steel will be utilized for equipment supports. The other new switchrack ("H-4") will be located at south end of the separator basins. One new feeder from Substation "H" to switchrack "H-3" will be installed. Switchrack "H-4" will be supplied from switchrack "H-3." A spare breaker for the feeder to switchrack "H-3" is existing at Substation "H." An extension to existing switchrack "H-1" is also required.

Nineteen new motors will be added. Control push buttons will be located at the motors. Running lights for eight motors will be provided in Building 321. A new panelboard will be provided in Building 321 for instrument power. A new transformer for instrument power will be provided.

DETAILED ELECTRICAL SYSTEMS BASIS (Cont'd)

Power for lighting will be supplied from the new 480-volt switchracks. General area lighting will be provided by wood-pole mounted, mercury vapor floodlights. Incandescent and/or mercury vapor fixtures as required will be provided for local lighting. Control of lighting will be by photocell. No additional telephone or communications systems are required, but an overall review of these systems will be provided in Phase III. Fire protection requires one additional alarm box near the chlorosilanes neutralization facilities. Lights and electric tracing are required for one eye-bath and safety shower near the separator basins.

Conventional grounding will be provided as required. No cathodic protection systems are planned.

The majority of circuit installations will be above ground in rigid metal conduit; however, some underground installations are required.

The electrical classification for areas below grade (sumps, trenches, pits) is hazardous Class I, Group D, Division 1. Areas above grade within 50 feet of chlorosilanes and process sewer neutralization facilities and separator basins are classified hazardous Class I, Group D, Division 2. All other areas including Building 321 are classified non-hazardous.

A pole line supporting 4160-volt service to the No. 1 Ranney Well crosses the area where the separator basins will be constructed. Relocation of one existing pole is required to clear the site. Circuit can be de-energized at existing disconnect device near Substation "H." No other power shutdowns are required.

Two new 75 hp pumps (1 spare) will be installed in the plant area at the clean water skimmer, located near coordinates N 700 and W 100. The 480-volt feeder to the existing switchrack in the area is not sufficient to carry the added load. A new feeder from Substation "D" to the switchrack will be provided. Extension of the switchrack is required.

DETAILED ELECTRICAL SYSTEMS BASIS (Cont'd)

Power and Control

A. Substation "H" (Waste Treatment Area)

1. Existing transformer has sufficient capacity to supply an estimated 100 KVA additional load. Transformer 750 KVA 4.16-.48 KV.

2. There are two spare 400 amp, 480-volt circuit breakers existing at Substation "H." One will be used for the feeder circuit to switchrack "H-3."

B. Substation "D" (Plant Area)

1. 480-volt transformer at Substation "D" has sufficient capacity to supply the additional 75 hp load.

2. Install a 225 amp circuit breaker for new feeder circuit to switchrack near clean water skimmer.

C. 480-Volt Feeders (Waste Treatment Area)

1. Install 3-1/C No. 500 MCM (copper) cables from 480-volt breaker in Substation "H" to switchrack "H-3" (± 100 feet).

2. There are two spare 3-inch conduits installed underground from Substation "H" to low level pipe rack on south side of fence line at approximate coordinates E 550 and N 1350 (± 45 feet). Extend one conduit underground to switchrack "H-3" (± 60 feet).

3. Install 3-1/C No. 250 MCM (copper) cables in 2-1/2-inch conduit from switchrack "H-3" to switchrack "H-4" at separator basins. Install conduit on pipe rack (± 250 feet).

D. 480-Volt Feeder (Plant Area)

1. Install 3-1/C No. 350 MCM (copper) cables in 3-inch conduit from Substation "D" to switchrack near skimmer pit (± 1100 feet).

2. Install overhead to east side of Avenue "B" near coordinates E 530 and N 750. A 3-inch conduit exists under Avenue "B" and railroad tracks. Install underground from railroad tracks to rack near skimmer pit.

DETAILED ELECTRICAL SYSTEMS BASIS (Cont'd)

Power and Control (Cont'd)

E. Switchracks (Waste Treatment Area)

1. Provide extension for existing switchrack "H-1."

2. Install on switchrack "H-1":

   a) Eight "NEMA-7" motor starters.
   b) One 480-volt circuit breaker (NEMA-7) with photocell control for floodlights.
   c) One 480-volt circuit breaker (NEMA-7), one 15 KVA, 480-240/120 volt transformer and one 12-circuit "NEMA-7" lighting panelboard.

3. Establish new switchrack "H-3" as back side of existing switchrack "H-2." Provide horizontal steel and new bus trough.

4. Install on switchrack "H-3":

   a) Three "NEMA-7" motor starters.
   b) One 225 amp "NEMA-7" circuit breaker for feeder to switchrack "H-4."

5. Establish new switchrack "H-4" near southeast corner of separator basins. Rack to be provided with roof.

6. On switchrack "H-4" install:

   a) Seven "NEMA-7" motor starters.
   b) One 480-volt circuit breaker (NEMA-7) with photocell control for floodlights.
   c) One 480-volt circuit (NEMA-7), one 15 KVA, 480-240/120 volt transformer and one 12-circuit lighting panelboard.
   d) One 480-volt welding receptacle.

F. Switchrack (Plant Area)

1. Provide extension for existing switchrack located near surface water skimmer pit.

DETAILED ELECTRICAL SYSTEMS BASIS (Cont'd)

Power and Control (Cont'd)

F. Switchrack (Cont'd)

2. Provide new bus trough. Disconnect existing feed to rack. Supply existing portion of rack from new bus trough.

3. Install on rack extension:

a) One "NEMA-7" size 4 motor starter. (NOTE: Install special throwover switch and common push button at the two 75-hp motors.)

G. Motor Control

1. Switchrack "H-1"

a) Six motors - Local push buttons only.

b) Two motors - Local push buttons and remote-running lights in Building 321.

2. Switchrack "H-3"

a) Three motors with local push buttons and remote-running lights in Building 321.

3. Switchrack "H-4"

a) Five motors - Local push buttons only.

b) Two motors with local push buttons and remote-running lights in Building 321.

4. Switchrack in Plant Area

a) One local push button for two motors. (NOTE: See above Item F-3a.)

H. Instrument Power - Building 321

1. Provide new 24-circuit 240/120 volt "NEMA-1" lighting panelboard.

2. Power source to be a new 25-KVA transformer.

3. Provide one 100 amp 480 volt circuit breaker for transformer feed. Mount on existing switchrack near building.

DETAILED ELECTRICAL SYSTEMS BASIS (Cont'd)

Lighting and Electric Heating (Waste Treatment Area)

A. Area Lighting

1. Provide mercury vapor 480-volt floodlights mounted on Class 4 wood poles.

2. Mount three 400-watt fixtures on each pole.

3. Provide three pole assemblies:
   one near separator basins
   one near process sewer neutralization equipment
   one near chlorosilanes neutralization equipment

4. Power for floodlights to be supplied by contactors at switchracks and controlled by photocells. Provide manual control switch to bypass photocell.

B. Local Lighting

1. Provide incandescent and mercury vapor fixtures as required.

2. Power for local lights to be supplied from lighting panelboards on switchracks.

3. Provide photocell and mercury relays for branch circuit control. Provide manual control switch to bypass photocell.

C. Safety Lighting

1. Provide green light (24 hours) at safety shower and eye-bath near separator basins. (Light is part of safety shower package.)

2. Provide red light (24 hours) at fire alarm box near chlorosilanes neutralization equipment.

D. Electric Heating

1. Provide electric heating for safety shower and eye-bath near separator basin. (Heater and light are a part of safety shower package. Use common circuit.)

2. Supply power from lighting panel on switchrack "H-4."

DETAILED ELECTRICAL SYSTEMS BASIS (Cont'd)

Telephone - Communications - Fire Alarm (Waste Treatment Area)

A. No telephone or communication system additions are required.

B. One secondary fire alarm box is required. Locate near chlorosilanes neutralization area. Primary Fire Alarm Box 511 is existing at Building 321. Secondary box to actuate Box 511.

Grounding

A. Method

1. Copper weld ground rods per Standard EL-50 shall be used.

2. No cathodic protection is required.

B. Motors

1. Electric switchracks shall be grounded.

2. Provide local grounding for motors.

C. Equipment

1. Provide local grounding as required. No grounding loops are required.

2. Existing facilities to be used for any required grounding at Building 321 and Substation "H."

Wire and Raceways

A. Wire

1. All wire shall be stranded copper.

2. Feeder cables shall have 600-volt Type XHHW insulation.

3. Power and lighting circuits shall have 600-volt Type THW insulation.

4. Lighting fixture wire to be Type SF-2.

5. Grounding wire to be bare.

DETAILED ELECTRICAL SYSTEMS BASIS (Cont'd)

Wire and Raceways (Cont'd)

B. Raceways

1. Raceways to be hot-dip galvanized rigid steel with threaded fittings.

2. Installations at separator basins to be plasti-bond type with PVC coating outside and epoxy coated inside.

C. Installations

1. Generally, conduit installations will be above ground supported by pipe supports.

2. Underground installations required where pipe supports do not exist.

Area Classifications

A. Hazardous - Class I, Group D, Division 1

1. Areas below grade (sumps - trenches - pits).

2. Include Items GDS2-202 and -203.

B. Hazardous - Class I, Group D, Division 2

1. Areas above grade within 50 feet of:

a) Process sewer neutralization facilities.
b) Chlorosilanes neutralization facilities.
c) Separator basins.
d) Clean water skimmer pit.

C. Non-Hazardous

1. Building 321.

2. Substation "D."

3. Substation "H."

4. Other areas above grade in excess of 50 feet from locations noted in VII-B.

DETAILED ELECTRICAL SYSTEMS BASIS (Cont'd)

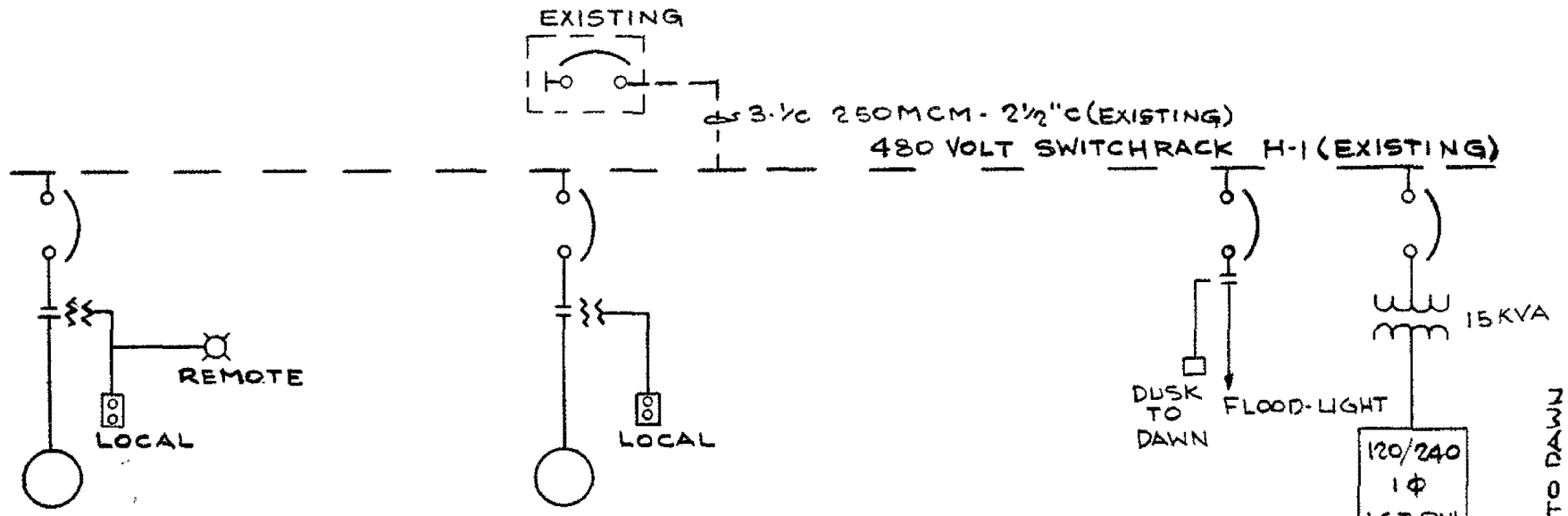
Drawings

Switchrack "H-1" - SK-RHN-10571.

Switchrack "H-3" - SK-RHN-82571 Rev. 10-5-71.

Switchrack "H-4" - SK-RHN-82471 Rev. 10-5-71.

Switchrack - Plant Area Substation "D" - SK-RHN-10671 Rev. 10-26-71.



ITEM	HP
GDS2-314	3
GDS2-315	3

ITEM	HP	
GDS2-304	25	EXIST
GDS2-305	3/4	EXIST
GDS2-306	30	EXIST
GDS2-310	1/4	
GDS2-310	1/4	
GDS2-311	1½	
GDS2-311	1/4	
GDS2-313	2	
GDS2-317	10	

TOTAL HP : 20¼

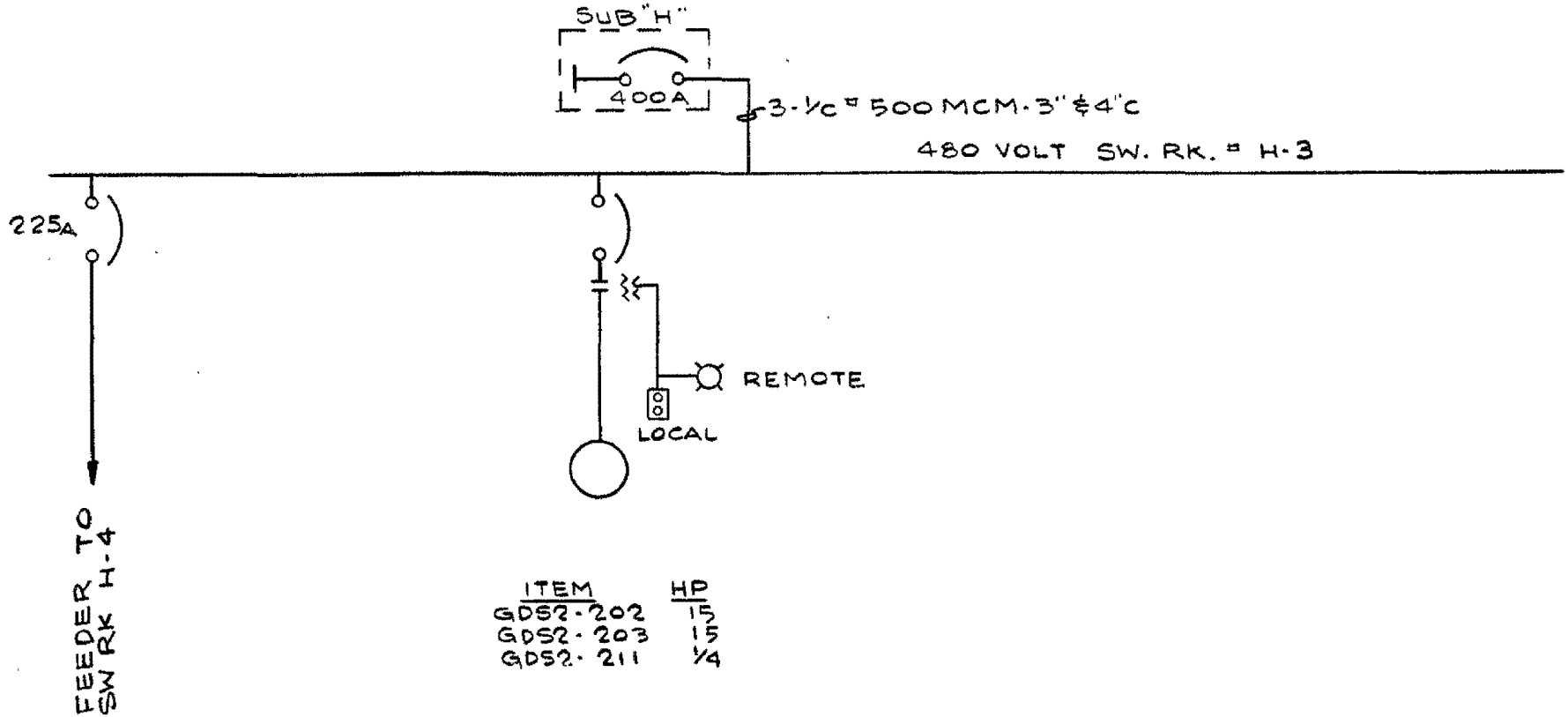
REV. 10-29-71

SISTERSVILLE WASTE WATER NEUTRALIZATION AND CLARIFICATION SYSTEM PHASE II

10/5/71 RHN 10571

SISVIL014509

EPA005553



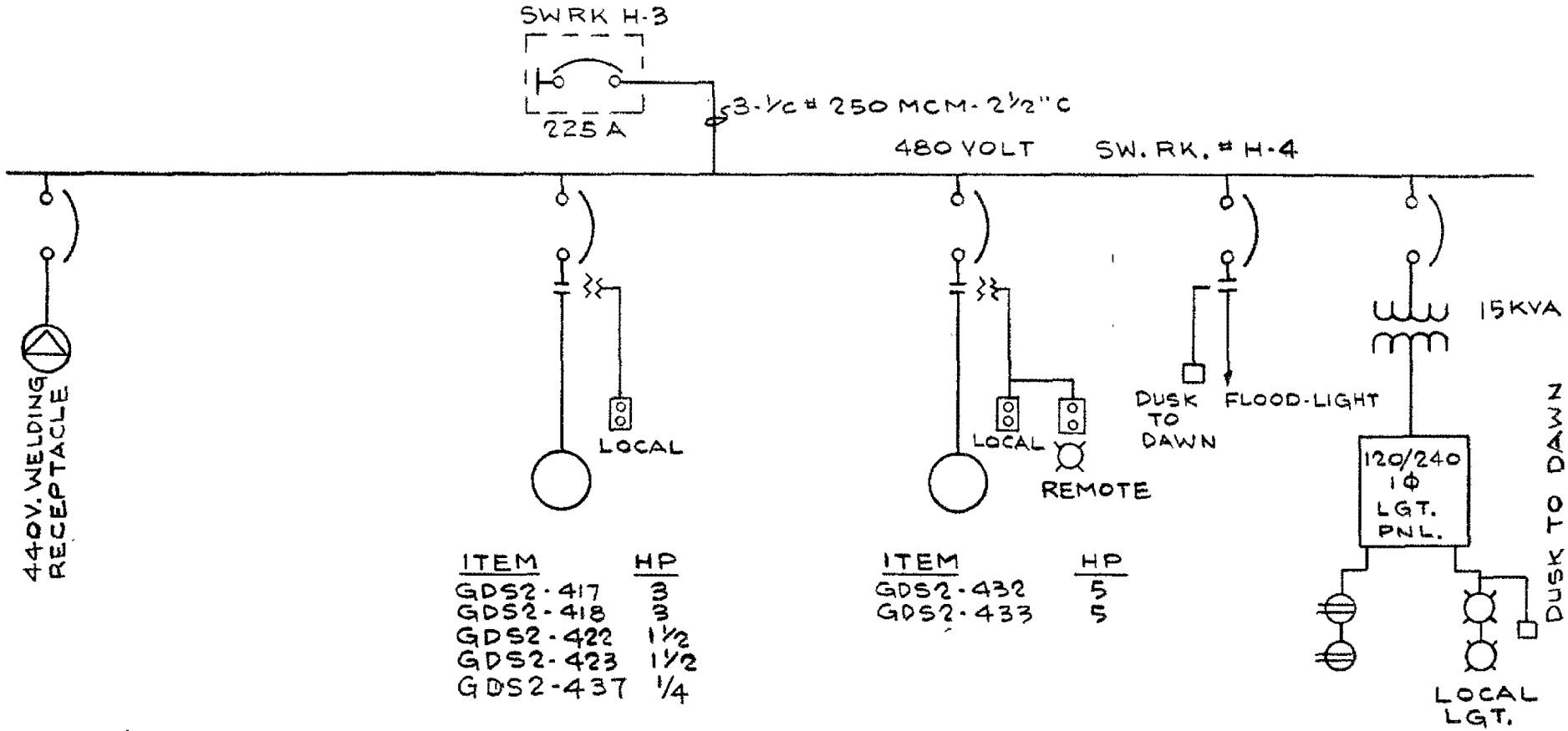
ITEM	HP
GDS2-202	15
GDS2-203	15
GDS2-211	1/4

TOTAL HP = 30 1/4

REV. 10-29-71

SISTERSVILLE WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM PHASE II

8/23/71 RHN-82571
REV. 10/5/71



ITEM	HP
GDS2-417	3
GDS2-418	3
GDS2-422	1½
GDS2-423	1½
GDS2-437	¼

ITEM	HP
GDS2-432	5
GDS2-433	5

TOTAL HP = 19¼

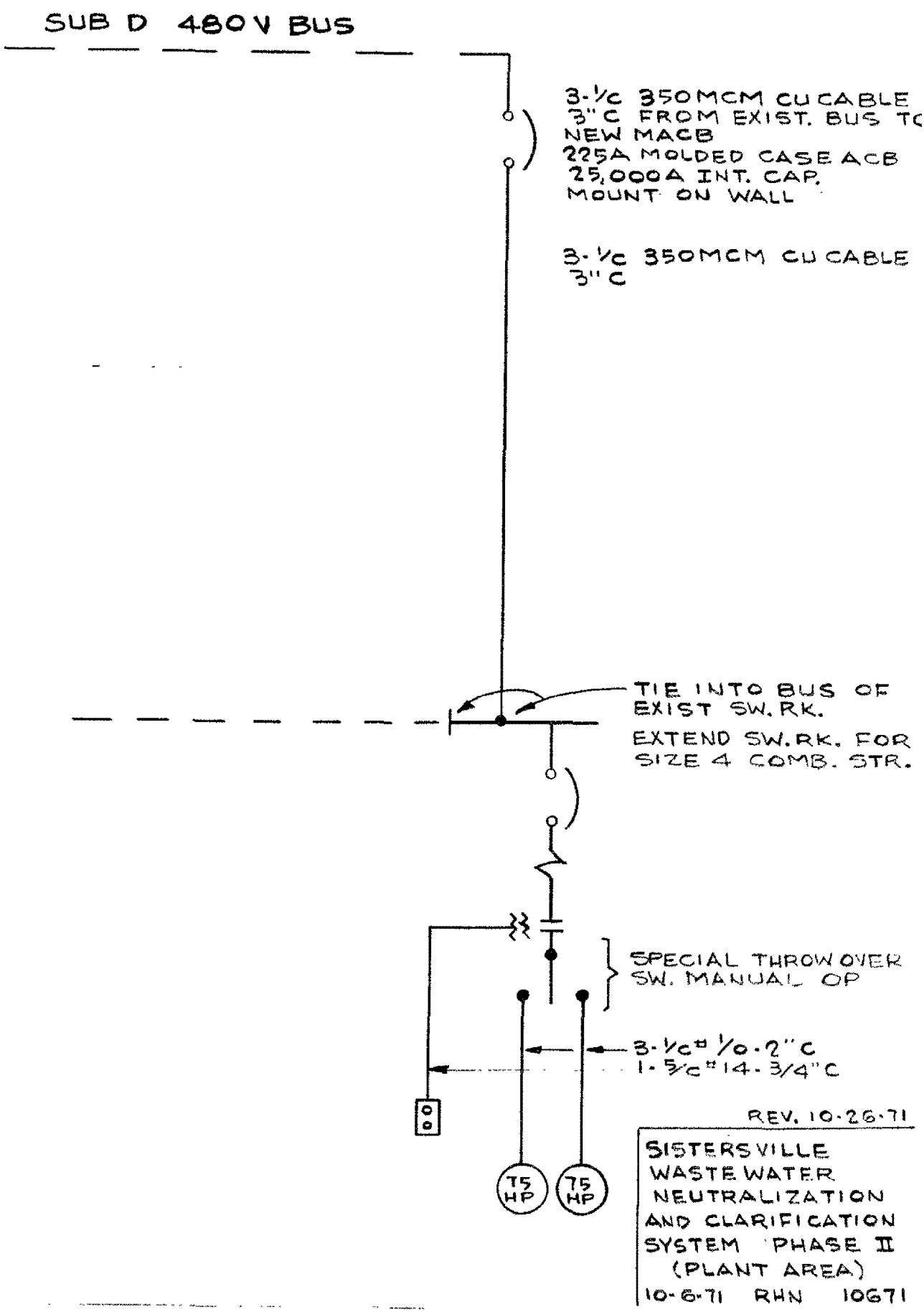
SISTERSVILLE WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM PHASE II

8/23/71
REV. 10/5/71

RHN - 82471

SISVIL014511

EPA005555



SISVIL014512

EPA005556

UNION CARBIDE

STANDARD

CHEMICALS AND PLASTICS OPERATIONS DIVISION
AND UNION CARBIDE CANADA LIMITED

SPECIAL VALVE AND PIPING SPECIFICATION: 65A60

DATE: 3-2-70

PRIMARY RATING - TEMPERATURE RANGE	HYDRO TEST	SERVICE
50 psi at 32°F to 200°F (0°C to 93°C)	100 psi	Chemicals
ADJUSTED PRESSURE - TEMPERATURE RATINGS	**CORROSION ALLOWANCE**	**MANDATORY GENERAL SPECS**
None	None	PPF-1, PPF-4, PPF-5

COMPONENTS	NOTES	1/2	3/4	1	1-1/2	2	2-1/2	3	4	6	8	10	12	14	16	18	20	24
PIPE	1	Solid Kynar, Schedule 80 Resistoflex Corporation "Fluoroflex-K (VF-2)"																
FITTINGS (Ells, Tees, Couplings, Laps, Unions, Bushings, Forgings)	1	Solid Kynar, threaded Resistoflex Corporation "Fluoroflex-K (VF-2)"																
VALVES	1	Screwed BALL; Kynar body, ball and stem; Teflon seats and seals Viton O-ring; with handle Hills McCanna Fig. P152-Ky-T-Ky or approved equal BA-1418																
SUPPORT SPACING at	100°F	Maximum span (feet) 4-1/4	4-1/2	4-3/4	5	5-1/4												
	120°F	3-1/2	3-3/4	4	4-1/4	4-1/2												
	140°F	2-1/2	3	3	3	3												
	160°F	c o n t i n u o u s																
THERMAL EXPANSION		Thermal expansion of Solid Kynar is 1/10th of an inch per 10 degree temperature rise per 10 foot length. This is normally absorbed by deflection or bowing in the piping system. However, in long straight runs, or in some special cases, it might be desirable to use expansion joints.																
CONSTRUCTION		CUTTING: Use a power or hand saw and miter box, or rotary pipe cutters. THREADING: Before threading, insert a wood or metal plug into the pipe to prevent distortion of the walls or off-center threads. Use a pipe threading machine or standard pipe stocks. Dies must be clean and very sharp, and a lubricant should be used. Threading dies with a front rake angle of 5° to 10° give best results. On power equipment, 5° negative front rake dies should be used without tapered guide sleeves. ASSEMBLING AND HANDLING: Use strap wrenches for Kynar, since ordinary pipe wrenches tend to score pipe and fitting surfaces. TFE thread paste is preferred over tape for use with threaded assemblies. Apply by rubbing into the root of the male thread. Avoid excessive torque in making threaded connections; one to two threads past handtight is sufficient to assure leakproof joints.															
		1/2	3/4	1	1-1/2	2	2-1/2	3	4	6	8	10	12	14	16	18	20	24

BOLTING: ASTM A307, Gr B square head bolts; heavy hex nuts

GASKETS: 1/8" thick Viton - full face.

DOPE: GASKET - None

THREAD - TFE thread paste - Conley Corp. or equal

NOTES: (1) "Kynar" is a trademark of Pennwalt Corporation, Industrial Chemicals Division for a crystalline homopolymer of vinylidene fluoride.

UNION CARBIDE **STANDARD**
CHEMICALS AND PLASTICS

SPECIAL VALVE AND PIPING SPECIFICATION: 66A60

PAGE: 1 of 1

DATE: 9-13-71

PRIMARY RATING - TEMPERATURE RANGE	HYDRO TEST	SERVICE
Thru 6": 100 psi at 0°C to 50°C (32°F to 122°F) 8" and larger: 45 psi	Thru 6": 150 psi 8" and larger: 70 psi	Process Wastes
ADJUSTED PRESSURE - TEMPERATURE RATINGS None	**CORROSION ALLOWANCE** None	**MANDATORY GENERAL SPECS** PPF-1, PPF-4, PPF-5

COMPONENTS	NOTES	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12	14	16	18	20	24
PIPE	1	Solid polypropylene - Schedule 80											Solid polypropylene - Series 80 (SDR 15.5)						
FITTINGS (ells, tees)	2	Molded solid polypropylene - Schedule 80; socket ends											Fabricate from Series 125 (SDR 9) pipe						
FLANGES Straight		Molded solid polypropylene - Schedule 80 socket ends; ANSI 150 lb drilling											Special design - polypropylene lap with metal back-up; ANSI 150 lb drilling						
FLANGES Blind		Molded solid polypropylene, ANSI 150 lb drilling											CI-125-FF with 1/4" thk full face plastic disc						
VALVES Shutoff		150 psi at 24°C (75°F) threaded ball; polypropylene body, ball and stem; Teflon seats; Viton o-ring seals, with handle											Teflon-lined - 150 - Wafer BF-1390						
JOINTS		All joints except bolted flanges and threaded valves shall be thermally fused. Procedures and equipment as supplied by pipe manufacturers shall be used.																	
		1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12	14	16	18	20	24

BOLTING: ASTM A307 Gr B square head bolts; heavy hex nuts

GASKETS: 1/8" thk Viton-full face

DOPE: GASKET - None

THREAD - Teflon tape

NOTES: (1) Series 80 and 125 pipe is made to ISO Standards and does not match steel pipe dimensions. Check manufacturer's data. SDR (Series dimension ratio) is the ratio of pipe ID to wall thickness.

SISVIL014514

EPA005558

SPECIAL VALVE AND PIPING SPECIFICATION: 6906l

UNION CARBIDE

Chemicals, Olefins, Plastics and Silicones Divisions;
Union Carbide Canada

PAGE: 1 of 1

DATE: 3-27-67

SERVICE RANGE	HYDRO TEST	SERVICE
150 psi @ 32°F to 130°F (0°C to 54°C)	200 psi for two hours and all leaks repaired before back fill	Fire water - underground
ADJUSTED PRESSURE-TEMPERATURE RATINGS: None	**CORROSION ALLOWANCE**: None	

COMPONENTS	NOTES	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12	14	16	18	20	24
PIPE									Asbestos-cement water pipe: Johns-Manville Transite Ring-Tite, Class 150										
COUPLINGS									Asbestos-cement: Johns-Manville Ring-Tite. (Furnished with pipe)										
FITTINGS (Elbows, Tees, Reducer)									Cast iron Ring-Tite: 3" to 12" ASA A21.10 short body 14" - 16" ASA B16.1 standard										
ADAPTERS									Cast iron, special Transite, or MOA Transite pipe per Johns-Manville recommendations										
JOINT RESTRAINT									Concrete thrust blocks per Johns-Manville recommendations										
FLANGES (Blind)									CI - 125 - FF										
VALVES: SHUTOFF									175 lb. CI Gate valve; bronze trim; Garlock 150 packing; mechanical joint or Ring -tite ends; with manufacturer's standard indicator post; centerline of valve _ ft. below grade. Mueller-Columbian A-2072 with A-20800 post or approved equal.										
VALVES: HYDRANTS AND HOSE VALVES	1								M&H Fig. H-104, 5-1/4 x 3 175 lb. Ring-Tite end HYDRANT; Underwriters approved; 5-1/4" inlet valve; two upper connections with caps and one upper connection with IBBM flanged and screwed independent hose gate valve with cap, all for 2-1/2" National Standard Thread hose couplings; 1-1/2" five-point National Standard operating nut, opening to left (counter-clockwise) with wrench; two lugs for 3/4" clamp rods; shoe to fit JM class 150 transite; painted red. Upper connections manufacturer's standard distance above grade; Carbide to specify distance centerline of inlet is below grade. (V-681)										
		1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6	8	10	12	14	16	18	20	24

BOLTING: Flanges: ASTM A307, Gr B square head bolts; heavy hex nuts

GASKETS: Pipe Joints: Molded rubber as furnished by manufacturer
Flanges: Compressed asbestos

NOTES:

A. Materials, design, fabrication, assembly, inspection and testing of piping shall comply with UCC Spec PFF-1, General Requirements for Valves and Piping; PFF-4, Specifications for Abbreviated Descriptions Used in Valve and Piping Specifications; and PFF-5, Valve Descriptions, where applicable.

B. All piping to be installed in accordance with Johns-Manville "Installation Guide - Transite Ring-Tite Pressure Pipe."

C. All lines shall be flushed in accordance with the following flow rates:
4" - 500 gpm
6" - 1500 gpm
8" - 2500 gpm
10" - 4000 gpm
12" and larger - 6000 gpm

(1) Set hydrants on undisturbed soil or a backfill of two shovels full of concrete. Provide a 2 ft. depth of gravel, broken stone, or other approved material around each hydrant drain.

SISVIL014515

EPA005559

SPECIAL VALVE AND PIPING SPECIFICATION: 61B60

PAGE: 1 of 2

DATE: 3-2-70

UNION CARBIDE

STANDARD

CHEMICALS AND PLASTICS OPERATIONS DIVISION
AND UNION CARBIDE CANADA LIMITED

PRIMARY RATING - TEMPERATURE RANGE	HYDRO TEST	SERVICE
Thru 4": 100 psi at 32°F to 250°F (0°C to 121°C) 6": 85 psi 8": 70 10", 12": 45 psi	Thru 4": 225 psi 6": 190 psi 8": 150 psi 10", 12": 90 psi	HCl Solvesso - HCl Acidic Silicones
ADJUSTED PRESSURE - TEMPERATURE RATINGS See table - page 2	**CORROSION ALLOWANCE** None	**MANDATORY GENERAL SPECS** PPF-1, PPF-4, PPF-5

	COMPONENTS	NOTES	1/2	3/4	1		1-1/2	2	2-1/2	3	4	6	8	10	12	14	16	18	20	24
	PIPE	2, 5	Fiberglas Reinforced Epoxy - Std																	
FITTINGS	THREADED NIPPLES																			
	COUPLINGS	2	Fiberglas Reinforced Epoxy - Std - Cement																	
	CEMENT		Bondstrand RP-34 or Fibercast Weldfast 220																	
	BUSHINGS AND PLUGS	2	Fiberglas Reinforced Epoxy - Std																	
	ELBOWS	2	Fiberglas Reinforced Epoxy - Std - Cement																	
	CAPS																			
	REDUCERS	3	Penton-lined CI-125-Flg																	
BRANCHES	FULL SIZE	2	Fiberglas Reinforced Epoxy - Std - Cement																	
	REDUCING	2																		
FLANGES	STRAIGHT	2, 4	Fiberglas Reinforced Epoxy - 150 - Cement - FF																	
	REDUCING	2, 4	Fiberglas Reinforced Epoxy - 150 - Cement - FF																	
	BLIND	2, 4	Fiberglas Reinforced Epoxy - 150 - FF																	
VALVES	SHUTOFF OR CONTROL	3, 6	Penton-lined CI-125-Flg DIA-1308																	
	CHECK (Horizontal)	3, 7	Penton-lined CI-125-Flg VC-53-F																	
	CHECK (Vertical)	3, 8	Penton-lined CI-125-Flg VC-52-F																	
			1/2	3/4	1		1-1/2	2	2-1/2	3	4	6	8	10	12	14	16	18	20	24

BOLTING: (4) ASTM A307, Gr B square head bolts; heavy hex nuts; and 2 shakeproof (external type) lockwashers

GASKETS: (3) 1/8" thick Viton full face

DOPE: GASKET - None

THREAD - Bolt only - Mobilkote 601

NOTES: A. Fabricate and install components in accordance with manufacturer's recommendations.

(1) Note deleted.

(2) Fiberglass reinforced epoxy - "Bondstrand", "Fibercast", "Conley Super Service", or A. O. Smith "Green Thread" (225°F max) brand pipe and fittings. Manufacturer's reference numbers as follows: Note: No reference numbers for Conley or A. O. Smith.

	Bondstrand	Fibercast		Bondstrand	Fibercast
Pipe	4000	QG2025	Ells - 45°	4504	Fig. 265C
Couplings	4501	Fig 14	90°	4503	Fig. 255C
Bushings - concentric	4508C	Fig. 33	Branches - Tees	4502	Fig. 275C
eccentric	4508EC	"	Reducing	4512	Use Bushings
			Flanges - Straight	4506	Fig. 18
			Blind	4406	Fig. 22
			Reducing	4509	Fig. 18R

SISVIL014516

EPA005560

(3) Products of Saran-Lined Pipe Company - manufacturer's reference numbers as follows:

Reducers:	Concentric	Fig 206
	Eccentric	Fig 208
Gaskets:		Fig 247

(4) Maximum bolting torque 40-inch pounds. Torque wrench required for all flange connections without exception.

(5) Maximum span between supports:

Size	1	1-1/2	2	3	4	6	8	10	12
Max span (ft)	5	7	9	10	12	10	10	10	10

(6) Use DIA-1309 for vacuum service in lines 4" and larger.

(7) VC-53-F - Penton-lined cast iron flanged horizontal check valve, F&D, 125 lb. ANSI; Fig. 255.

(8) VC-52-F - Penton-lined cast iron flanged vertical check valve, F&D, 125 lb. ANSI; Fig. 256

PRESSURE-TEMPERATURE RATINGS
(Maximum pressure, psi)

Maximum temp, °C	32 to 100	150	200	250
Maximum temp, °C	0 to 38	66	93	121
Thru 4"	150	140	120	100
6"	125	115	100	85
8"	100	95	85	70
10", 12"	60	55	50	45

MATERIALS OF CONSTRUCTION BASIS

The materials of construction have been determined from corrosion rack tests made in the existing acid sewer at the Sistersville Plant. The recommendations of the Materials of Construction Group are reflected in the Equipment Description section, the Process Flow Diagram section, and the Special Valve and Piping section.

EQUIPMENT LIST - PART 2

Item No. GDS2-	Description	Purchased Cost
201	NEUTRALIZATION PIT 10 ft 0 in. wide, 10 ft 0 in. deep, 20 ft 0 in. long reinforced concrete with baffle to divide into two (2) 10 ft 0 in. long chambers. Walls to be 1 ft 0 in. thick, bottom of pit approx. 24 ft below grade, acid brick-lined bottom and walls to 14 ft 0 in. from bottom, Phenoline 302 Coating on concrete above brick lining.	By Cost Engineer
202	NO. 1 NEUTRALIZATION PIT AGITATOR Philadelphia PTEO, Size 10, 3 in. dia x 154 in. shaft, 40 in. dia turbine, Hastelloy C shaft and impeller, 15-hp drive motor, explosion-proof, existing gearbox and drive from Goodrich-Gulf Waste Treatment Plant - Institute, new shaft and impeller.	$ 7,700
203	NO. 2 NEUTRALIZATION PIT AGITATOR. Same as Item GDS2-202, except use existing 316 stainless-steel shaft and agitator.	0
204 thru 210	Not Assigned	
211	SAMPLE PUMP (SPARE) 10 gpm x 50 ft head, Hastelloy B or C, 1/4-hp motor. Will spare existing pump GDS-126.	1,900
212	Not Assigned	
213	SLUICE GATE OPERATOR For existing 30 in. sluice gate.	1,500
214	SLUICE GATE OPERATOR Same as Item GDS2-213.	1,500

EQUIPMENT LIST - PART 3

Item No. GDS2-	Description	Purchased Cost
301	PICK-UP PANS For rail hopper car unloading.	Existing Installed
302	FILTER To filter air intake to pick-up pans.	Existing Installed
303	FILTER RECEIVER To receive lime unloaded from rail car prior to transfer to bulk storage. 3 ft 0 in. dia x 13 ft 6 in. high, steel, ±17 in. Hg design pressure, 140 ft^2 cloth area, cloth is 11 oz Dacron felt, 4 in. inlet nozzle.	Existing Installed
304	VACUUM BLOWER To transfer lime from rail car to filter receiver. 16,000 lb/hr lime capacity, 25 hp, 440 V, 60 cycle, 3-phase TEFC motor and NEMA starter.	Existing Installed
305	ROTARY CONVEYING VALVE To transfer 16,000 lb/hr lime, 3/4 hp, 440 V, 60 cycle, 3-phase TEFC motor and NEMA starter.	Existing Installed
306	PRESSURE BLOWER To transfer 16,000 lb/hr lime from filter receiver to bulk storage bin, 30 hp, 440 V, 60 cycle, 3-phase TEFC motor and NEMA starter.	Existing Installed
307	BULK LIME STORAGE BIN 16 ft 0 in. dia x 53 ft 0 in. overall height, light-weight concrete air-cell stave construction, 45 ft 0 in. bin height with 60° steel cone bottom, 8 ft 0 in. clearance between bottom of cone and bottom of bin side wall.	$ 17,100
308	FILTER RECEIVER To filter lime dust from conveying air on top of bulk-lime storage bin. 2 ft 6 in. dia x 12 ft 0 in. high, steel, 72 ft^2 cloth area.	1,000
309	SLIDE GATE VALVE 8 in. pneumatic operated, steel.	600
310	GRAVIMETRIC BELT FEEDER Weigh-belt type with 9 in. belt, 1/4-hp belt drive motor, 1/4-hp rotary valve motor, 100/4,000 lb/hr lime feed rate, all motors TEFC.	Included in Cost for Item GDS2-311

Item No. GDS2-	Description	Purchased Cost
311	LIME SLAKER Paste type with grit elevator, 100/4,000 lb/hr capacity, 1-1/2-hp slaker-mixer motor, 1/4-hp grit removal motor, all motors to be TEFC.	$ 15,000
312	LIME SLURRY HOLD TANK 675 gal, open top, steel, 5 ft 0 in. dia x 6 ft 0 in. high, to provide 1 hour holdup.	1,000
313	AGITATOR - For lime slurry hold tank, 2-hp drive motor, TEFC, - gear drive, propeller type, steel.	600
314	LIME SLURRY FEED PUMP 60 gpm x 100 ft head, nickel hardened steel, 3-hp motor, TEFC.	1,300
315	LIME SLURRY FEED PUMP (SPARE) Same as Item GDS2-314.	1,300
316	GRIT DUMPSTER 5 ft x 5 ft x 4 ft high, steel.	500
317	LIME SLURRY CIRCULATING PUMP 350 gpm x 50 ft head, nickel hardened steel, 10-hp motor, TEFC.	1,900
318	LIME SLURRY STORAGE TANK (EXISTING) Use existing Tank T-427-V, 15,000 gal, to provide 1 day holdup.	Existing Installed

EQUIPMENT LIST - PART 4

Item No. GDS2-	Description	Purchased Cost
401	INLET SUMP To receive process sewer, concrete construction, grating on top, 6 ft long, 4 ft wide, 3-1/2 ft deep below grade and 4-1/2 ft total wall depth.	By Cost Engineer
402	SLUICE GATE 18 in. square sluice gate, carbon steel, controls flow to Separator A, Phenoline 368 Coating on wetted steel parts.	$ 1,200
403	SLUICE GATE Same as Item GDS2-402, except controls flow to Separator B.	1,200
404 thru 414	Not Assigned	
415	BASIN FOR SEPARATOR A Reinforced concrete construction, 20 ft wide, 11 ft deep, 105 ft long, 12 in. thick outer walls and 8 in. thick walls for baffles.	By Cost Engineer
416	BASIN FOR SEPARATOR B Same as Item GDS2-415.	By Cost Engineer
417	FLIGHTS FOR SEPARATOR A Standard steel construction for flight chains and drive chains, redwood flights 20 ft wide spaced 10 ft apart, drive motor - 3 phase, 60 cycle, 460 V motor with a common drive for both separator flights with jaw clutches for independent operation, 3-hp TEFC motor, Phenoline 368 Coating on all wetted steel parts.	40,000* 3,000*
418	FLIGHTS FOR SEPARATOR B Same as Item GDS2-417.	*
419 and 420	Not Assigned	

*Supplied by vendor as a package unit, $3,000 allowance for Phenoline 368 Coating.

Item No. GDS2-	Description	Purchased Cost
421	SCUM REMOVAL PIPE Slotted pipe at downstream end of each separator to collect floating material. A common pipe will discharge floatables to collection sump.	*
422	SETTLEABLES SCREW CONVEYOR FOR SEPARATOR A 18 in. dia screw conveyor 20 ft long, standard steel construction, right-hand screw action, 3 phase, 60 cycle, 460 V TEFC drive motor to develop 1-1/2 hp at 1,750 rpm, motor reducer to have 20 rpm output speed, Phenoline 368 Coating on all wetted steel parts.	*
423	SETTLEABLES SCREW CONVEYOR FOR SEPARATOR B Same as Item GDS2-422 except left-hand screw action.	*
424	REACTION JET One or a series of baffles to distribute influent at upstream section of separator.	*
425	REACTION JET Same as Item GDS2-424.	*
426 and 427	Not Assigned	
428	EFFLUENT SUMP Formed as part of separator effluent box, concrete construction, 5 ft long, 5 ft wide, 7 ft deep.	By Cost Engineer
429 and 430	Not Assigned	
431	SCUM COLLECTION SUMP Reinforced concrete construction, 5 ft 3 in. long, 5 ft 0 in. wide, 9 ft 1-1/2 in. deep, 12 in thick walls.	By Cost Engineer
432	SLUDGE PUMP NO. 1 Centrifugal self-priming sludge pump 1-1/2 in. x 2 in., standard steel construction, slurry operation with slurry at about 5% colloidal solids, 50 gpm at 80 ft of head, 5-hp TEFC motor at 1,750 rpm, pneumatic level controls.	$ 1,200
433	SLUDGE PUMP NO. 2 Same as Item GDS2-432.	1,200

Item No. GDS2-	Description	Purchased Cost
434 thru 436	Not Assigned	
437	SAMPLE PUMP 10 gpm x 50 ft head, Hastelloy B or C, 1/4-hp motor.	$ 1,900

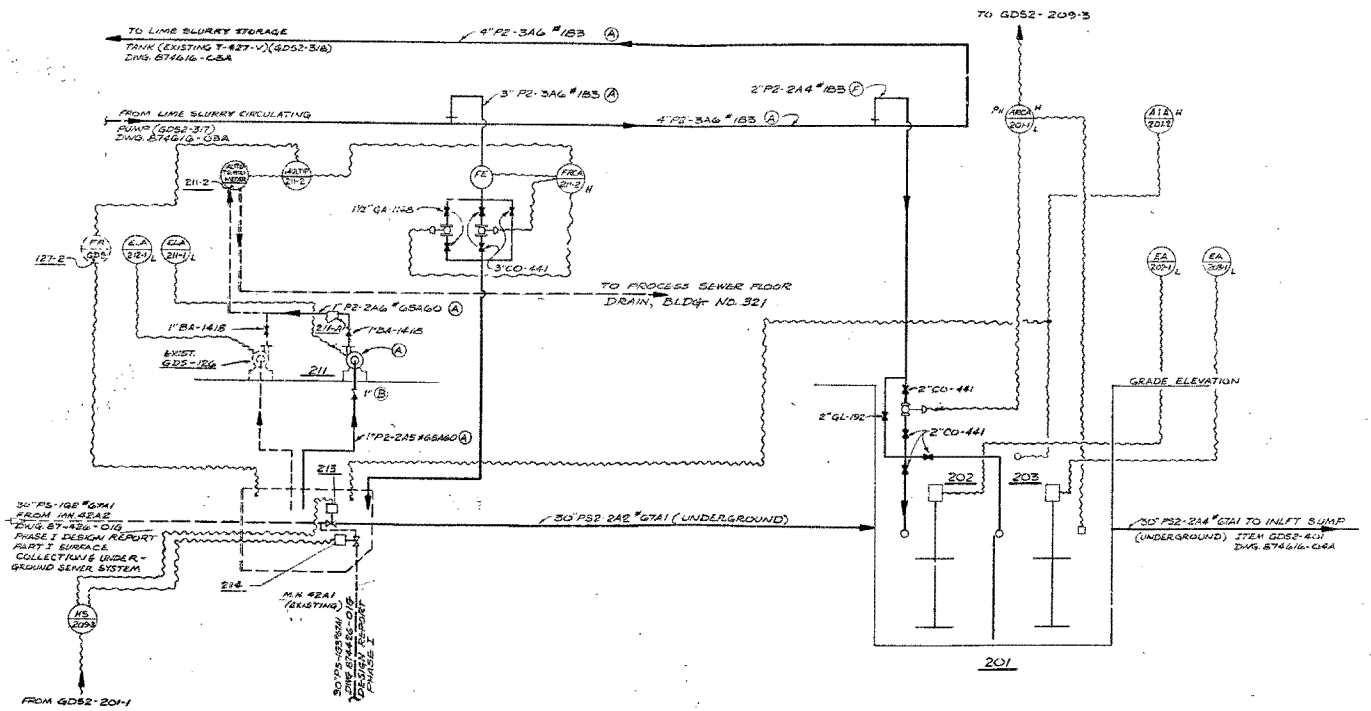
EQUIPMENT LIST - PART 5

Item No. GDS2-	Description	Purchased Cost
501	NO. 1 SLUDGE POND 70 ft wide, 190 ft long, 10 ft water depth, 12 in. clay lining, 12 in. thick gravel layer on top of clay, 6 in. thick sand layer on top of gravel, perforated pipe drain system in gravel layer (see flow diagram for pipe layout and size; see Layout Drawing SK-109381 for dimensions of dike wall).	By Cost Engineer
502	NO. 2 SLUDGE POND Same as Item GDS2-501.	By Cost Engineer

EQUIPMENT LIST - PART 6

Item No. GDS2-	Description	Purchased Cost
601	EYE-BATH AND SAFETY SHOWER	By Cost Engineer
602	Not Assigned	
603	RECYCLE WATER PUMP 750 gpm x 320 ft head, cast iron, vertical turbine type, 75-hp TEFC motor.	$ 5,000
604	RECYCLE WATER PUMP (SPARE) Same as Item GDS2-603.	5,000

938-3800



NOTES:

(A) INSULATE AND STEAM TRACE TO PREVENT FREEZING.

(B) 1" TEFLON "CHECK-ALL" VALVE MFG. CO. UNION INSERT TYPE FOR USE WITH SOLID KYNAR THREADED UNION RESISTOFLEX CORP. FLUOROFLEX-K (VF-2) VALVE NO UIV-100-T-SS, TEFLON COATED.

(F) ELECTRIC TRACE AND INSULATE 50°F.

ALL ITEMS ON THIS FLOW DIAGRAM HAVE THE PREFIX GDS2-.

PROCESS ENGINEER: J.M SMITH
CONTROL SYSTEMS REVIEWER: T.C. NELSON
ENGR. ASSISTANT: R.H. NEELEN
GROUP LEADER: B.L. BAILEY
SAFETY REVIEWER: W.D. BRADBURY, JR.

DRAWN BY	CHECKED BY	APPROVED BY	DATE
K.S. TYREE			9-29-71

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION
FLOW DIAGRAM

SISTERSVILLE, WEST VIRGINIA
WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM
PHASE II
PART 2 - PROCESS SEWER NEUTRALIZATION

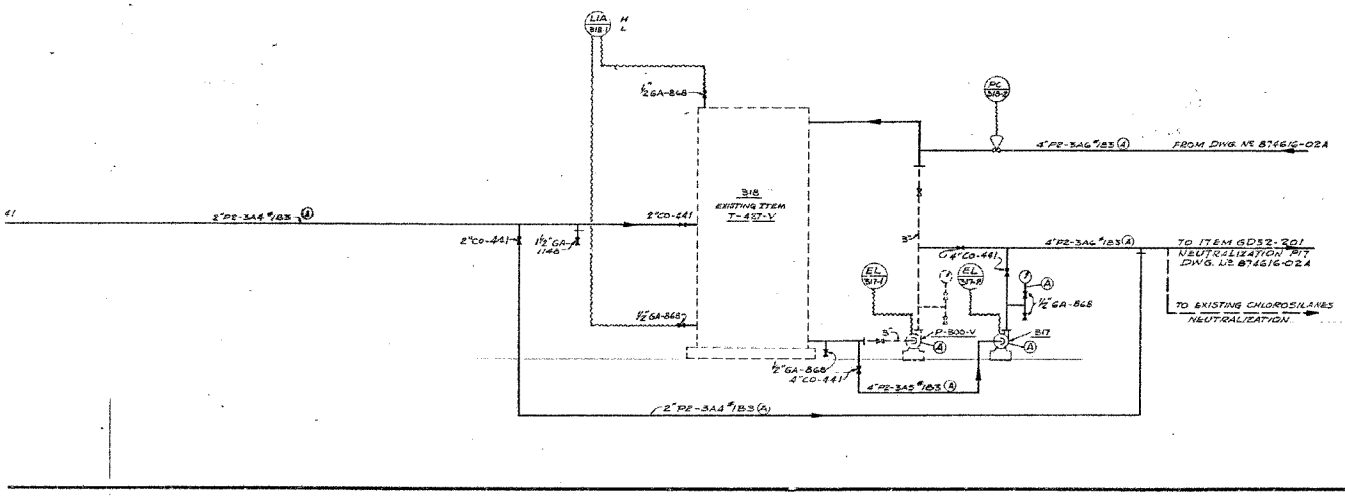
LOCATION	UNIT	SERVICE	DRAWING NUMBER
SBC		0.65	874610-02A

SISVIL014527

EPA005571

938-3800

NOTE
(A) INSULATE AND STEAM TRACE TO PREVENT FREEZING.



ALL ITEMS ON THIS FLOW DIAGRAM HAVE THE PREFIX GDS 2

PROCESS ENGINEER: J.A.I. SMITH
CONTROL SYSTEMS: J.P. NELSON
REVIEWER: R.H. LEELEN
ENGR. ASSISTANT: B.L. DAVEY
GROUP LEADER: W.D. BRADLEY JR.
SAFETY REVIEWER:

PROCESS AND CONTROL
FLOW DIAGRAM

DRAWN BY	CHECKED BY	APPROVED BY	DATE	SCALE
T.W.M.			8-6-71	NONE

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION

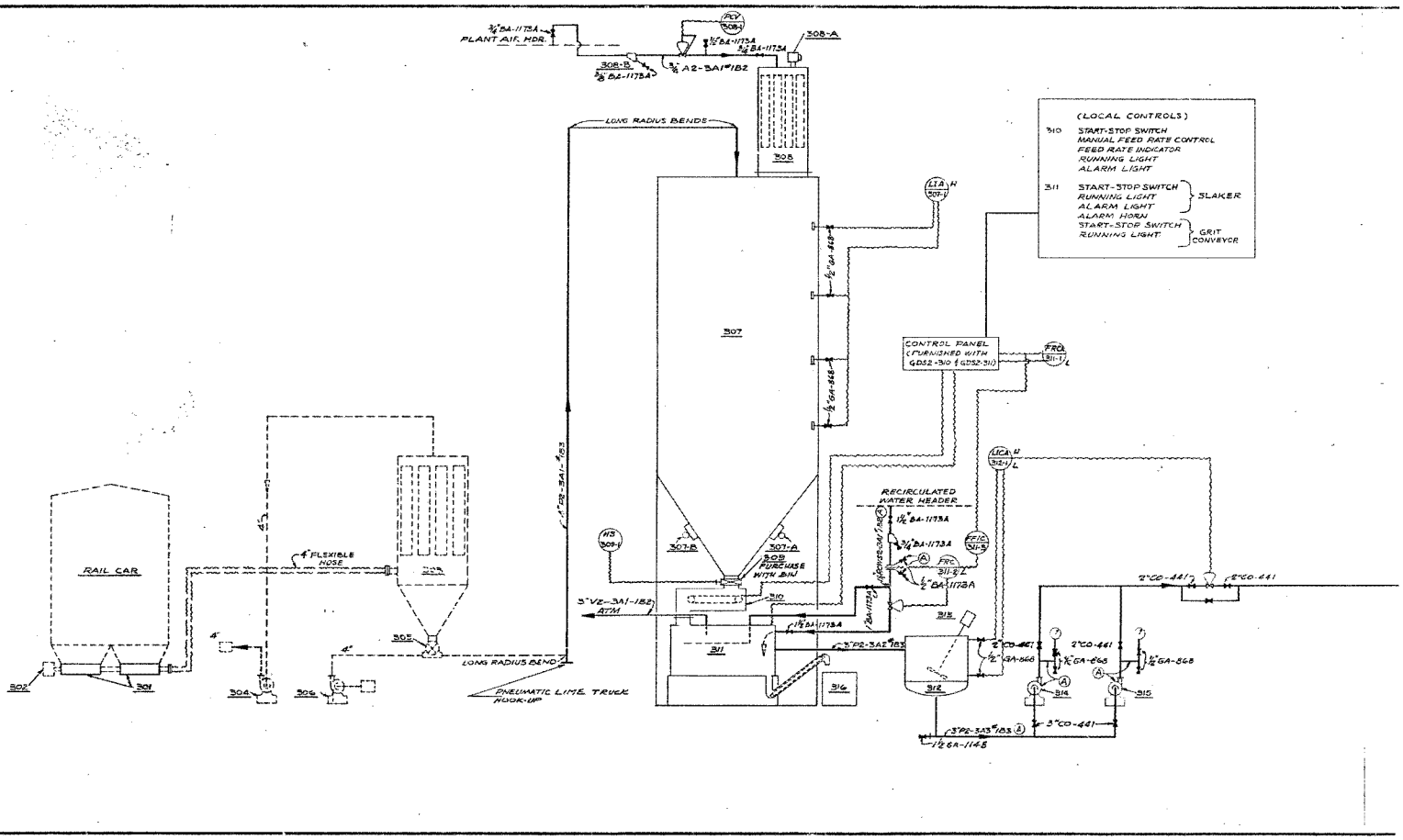
JOB NUMBER	UNIT NUMBER	PLANT	AREA

SISTERSVILLE, WEST VIRGINIA
WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM
PHASE II — PART 3
LIME STORAGE/SLURRY PREPARATION

LOCATION	SHEET NUMBER	DRAWING NUMBER
32C	D-65	874616-03-A

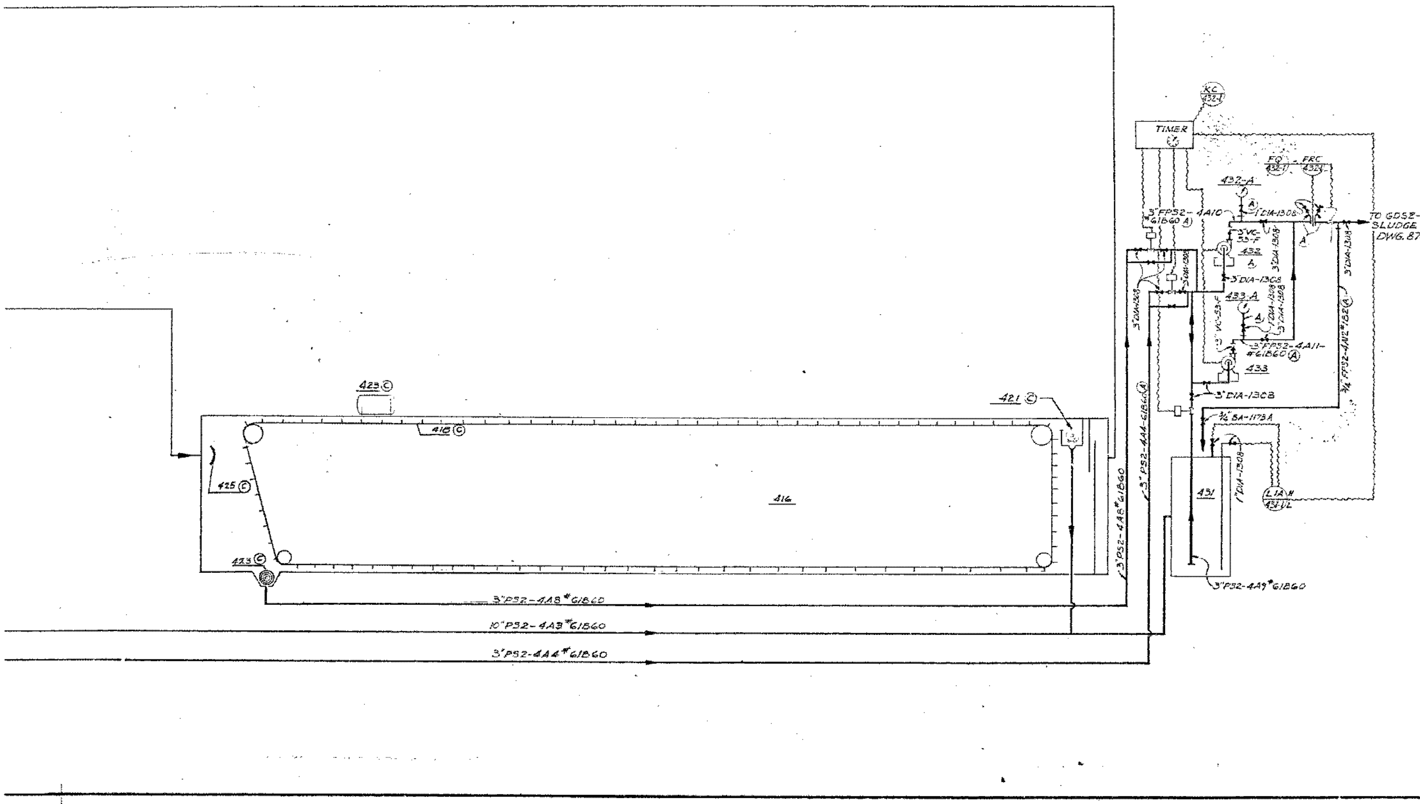
SISVIL014528

EPA005572



SISVIL014529

EPA005573



935-3805

NOTES

Ⓐ INSULATE AND STEAM TRACE TO PREVENT FREEZING.

Ⓑ 1" TEFLON CHECK-ALL VALVE MFG. CO. UNION INSERT TYPE FOR USE WITH SOLID KYNAR THREADED UNION RESISTOFLEX CORR FLUORFLEX-K (VF-2) VALVE NO. UV-1C0-T-SS TEFLON COATED.

Ⓒ THIS ITEM TO BE PURCHASED AS A PART OF A PACKAGE UNIT

ALL ITEMS ON THIS FLOW DIAGRAM HAVE THE PREFIX GDS2-

L.A. PEGGS
PROCESS ENGINEER: W.L. ROSS
CONTROL SYSTEMS: J.C. NELSON
REVIEWER: R.H. NEELEN
ENGR. ASSISTANT: B.L. BAILEY
GROUP LEADER: W.D. BRADBURY, JR.
SAFETY REVIEWER:

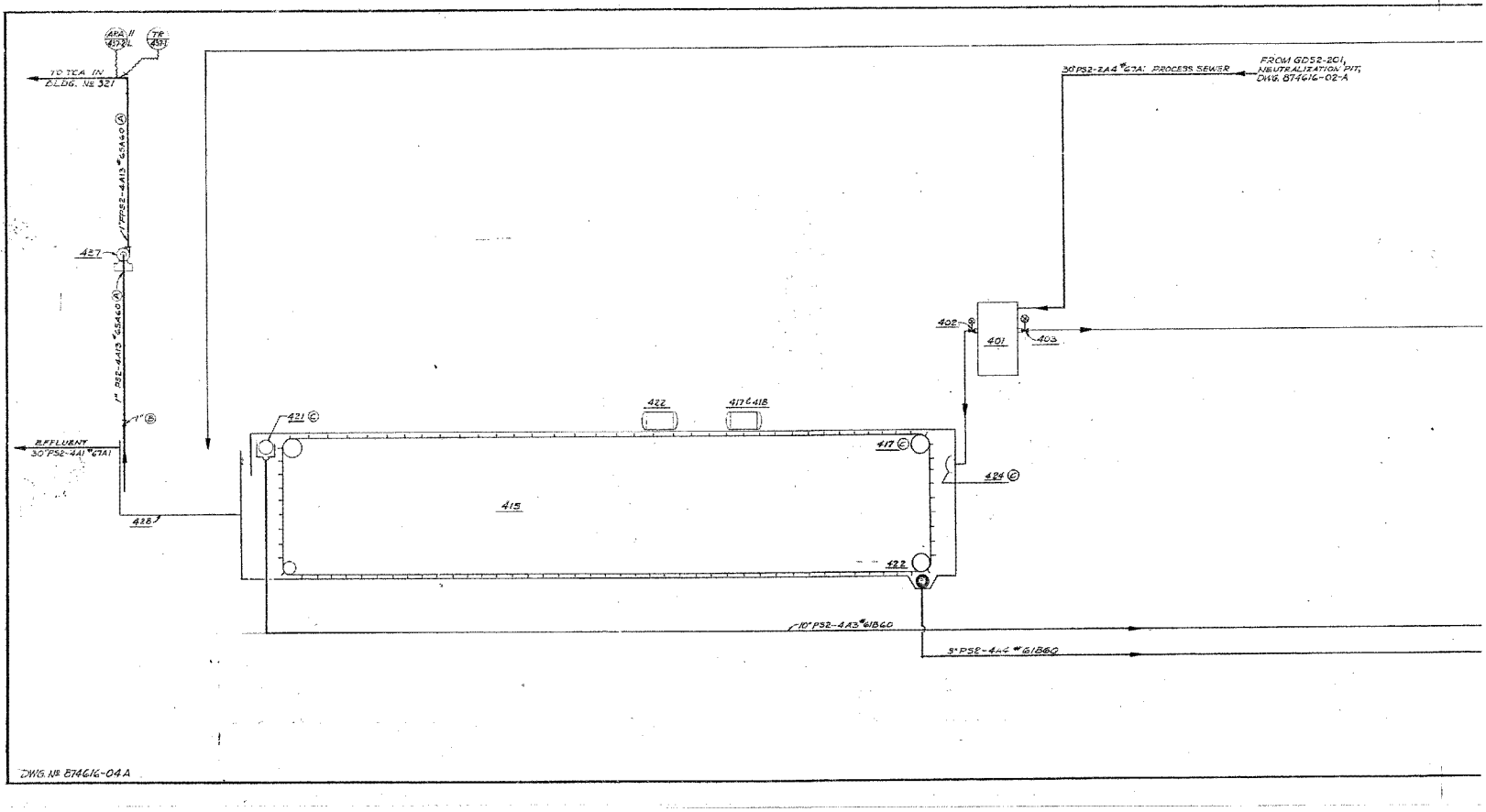
T.W.A

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION

FLOW DIAGRAM

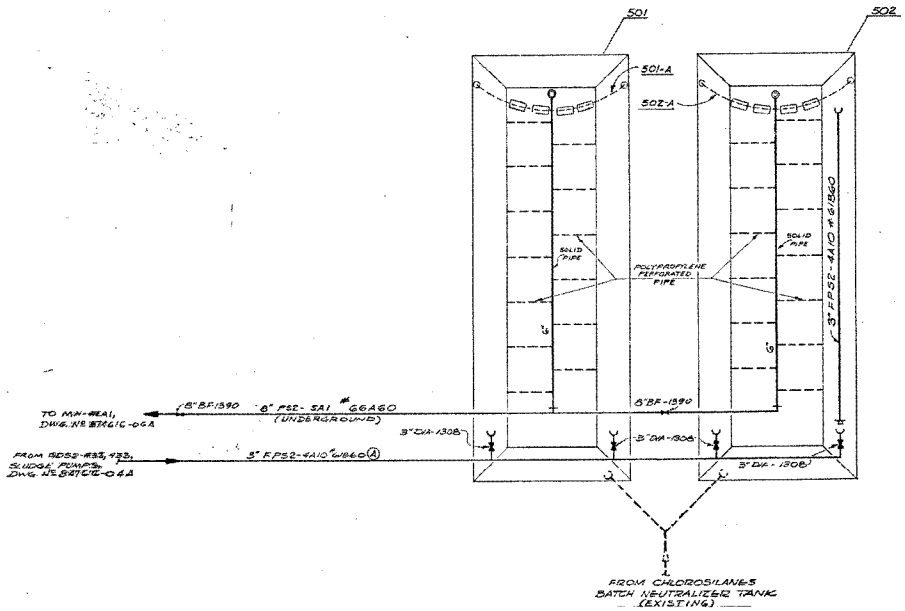
SISTERSVILLE, WEST VIRGINIA
WASTEWATER NEUTRALIZATION
AND CLARIFICATION SYSTEM
PHASE II
PART 4-PRIMARY CLARIFICATION

38 | 0.85 | 874616-04-A



SISVIL014531

938-3800



NOTE:
(A) INSULATE AND STEAM TRACE TO PREVENT FREEZING.

ALL ITEMS ON THIS FLOW DIAGRAM HAVE THE PREFIX 31 65-

PROCESS ENGINEER: L.A. MOSS
CONTROL SYSTEMS: T.C. NELSON
REVIEWED: R.H. NEELEN
ENGR. ASSISTANT: B.L. BAILEY
GROUP LEADER: W.D. BRADBURY JR.
SAFETY REVIEWER:

PROCESS AND CONTROL FLOW DIAGRAM

DRAWN BY	ITEM	DATE	SCALE	FSE
K.T.YAGE		5/27/ 1974		

ENGINEERING DEPARTMENT
UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS SOUTH CHARLESTON, WEST VIRGINIA

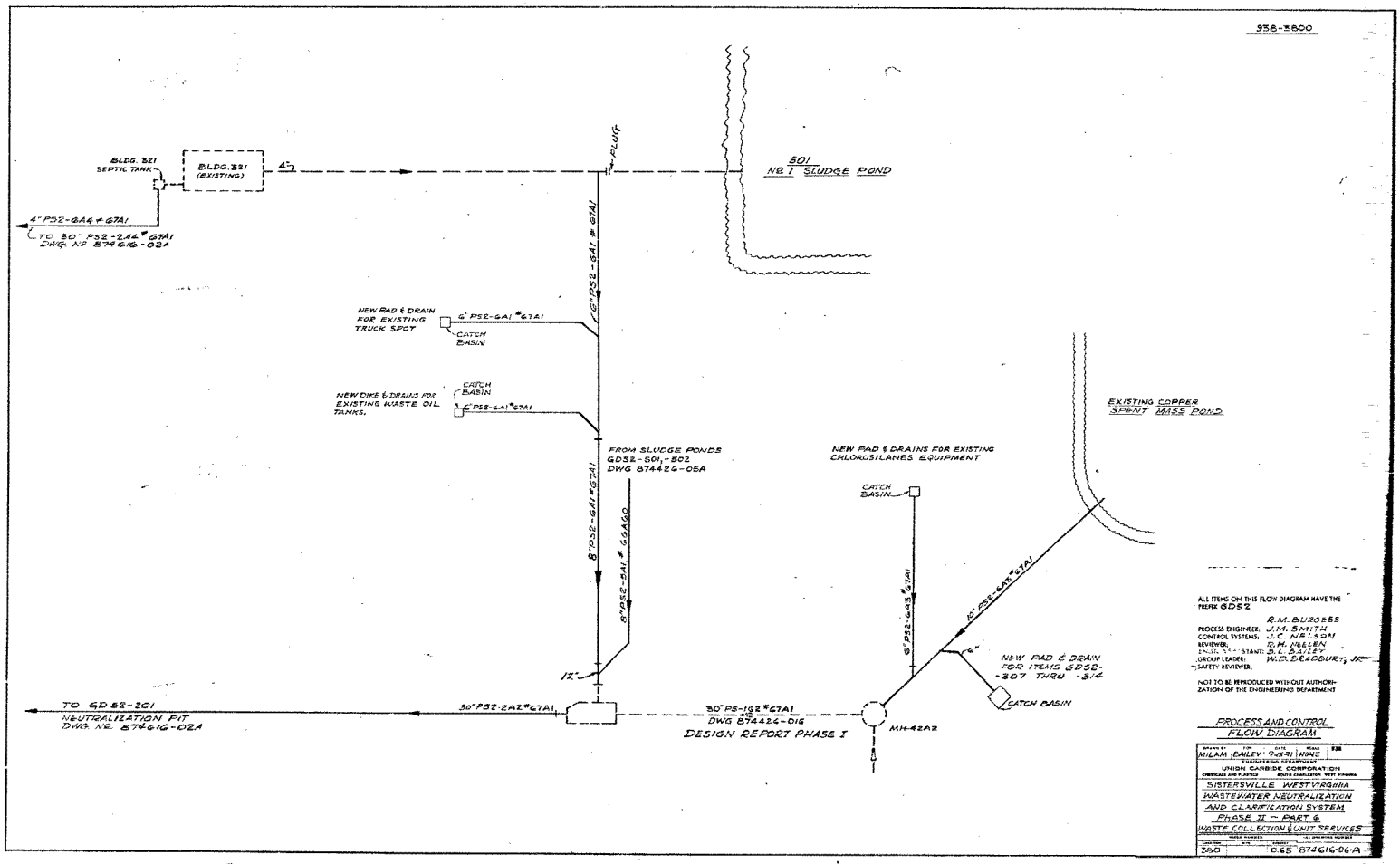
SISTERSVILLE, WEST VIRGINIA

WASTEWATER NEUTRALIZATION AND CLARIFICATION SYSTEM
PHASE II
PART 5 - SOLIDS DEWATERING

DRAWING	SHEET	REVISION	JOB NUMBER
380		0.65	8746/6-05A

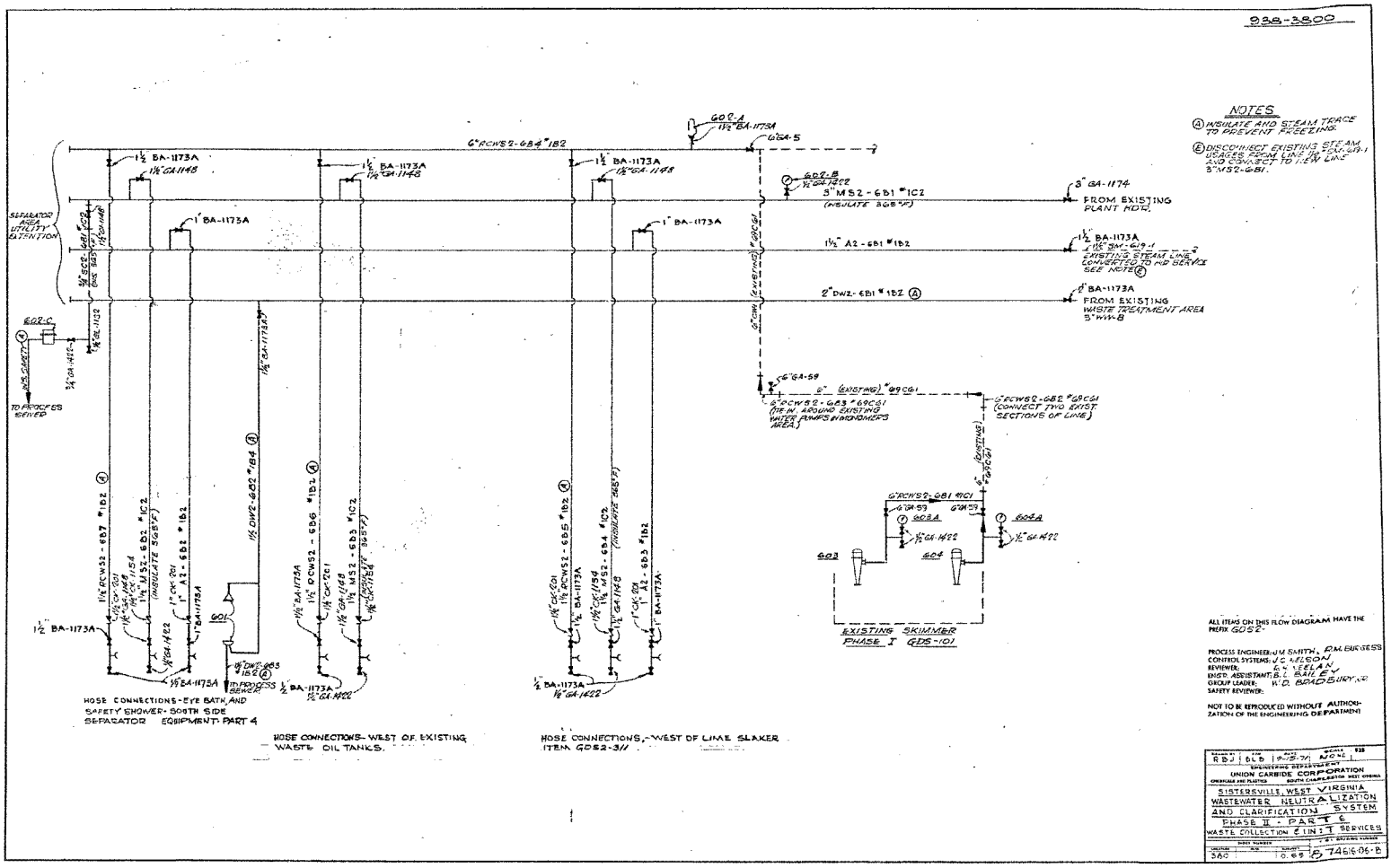
SISVIL014532

EPA005576



SISVIL014533

EPA005577



SISVIL014534

EPA005578